DEC 29 1922

INDEX NUMBER

Vol. VIII DECEMBER, 1922 No. 12

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The International Journal of Orthodontia, Oral Surgery and Radiography

A Monthly Journal Devoted to the Advancement of the Sciences of Orthodontia, Oral Surgery, and Dental and Oral Radiography

Martin Dewey, D.D.S., M.D., New York
Editor

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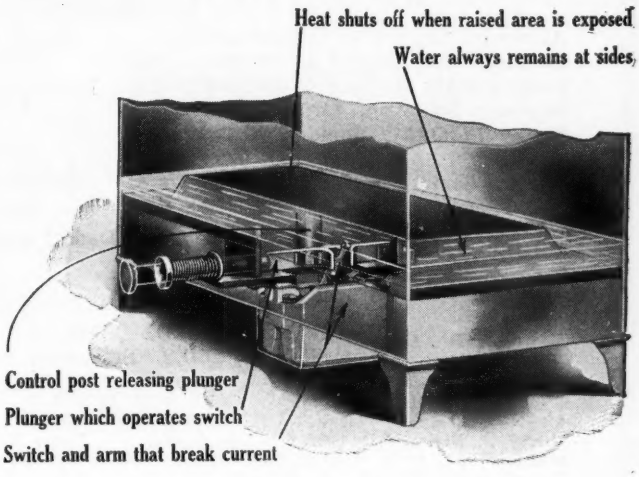
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A Monthly Journal Devoted to the Science of Orthodontia, Including Surgical Orthodontia, Oral Surgery, and Dental and Oral Radiography

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VOL. VIII ST. LOUIS, DECEMBER, 1922 No. 12

ORIGINAL ARTICLES

ARCH PREDETERMINATION AND A METHOD OF RELATING THE PREDETERMINED ARCH TO THE MALOCCLUSION, TO SHOW THE MINIMUM TOOTH MOVEMENT*

BY FREDERICK L. STANTON, D.D.S., NEW YORK

IN order to solve any problem we must first know the nature of the problem. The solution usually rests on the ability of the investigator to state his problem. We are met to discuss two very complex and baffling questions.

1. The predetermination of the normal form and dimensions of human dentures (by mensuration of plaster models of the irregularly placed teeth).

2. The placement of the map of occlusion over the map of malocclusion in such a way as to show a minimum of movement, to change from malocclusion to occlusion. A more precise statement would be that the sum of the squares of displacement shall be a minimum.

It would be superfluous to waste the time of this audience in describing the mutual mechanical relations of a normal human denture. In your postgraduate course you were taught that each cusp had its normal place to fit in the opposing arch; that each tooth bore a definite relation to the neighboring teeth, producing when normal, the picture so well known to you all, of normal occlusion.

If we wish to predetermine the form of a dental arch we must first know how *normal arches* vary in form and dimension.

The anthropologists tell us that normal arches may be found in a wide range of forms in normal skulls. They classify them as elliptic, ovoid, approaching circular, U-shaped, and diverging.

*Read before the twelfth annual meeting of the Alumni Society of the Dewey School of Orthodontia, Chicago, Ill., April 27-28, 1922.

(*Copyrighted*, 1922)

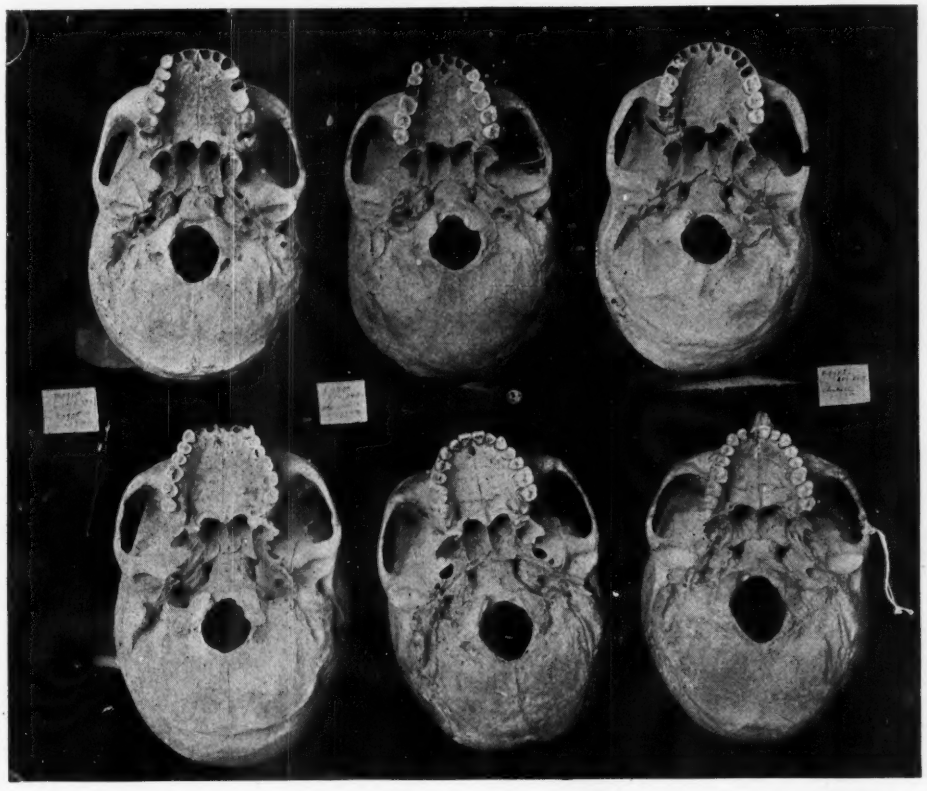
Figs. 1 and 2.—See Fig. 3.

In regard to breadth they designate them within the limits of the normal as medium, narrow and broad, and according to length as medium, short and long. According to the ratio width divided by length, they speak of them as:

1. Dolicho uranic.
2. Meso uranic.
3. Brachy uranic.

Dolicho uranic when arch index is below 110; meso uranic when arch index is between 110-115; brachy uranic when arch index is above 115.

As Hrdlicka points out, there is a wide range of variation in the *relative*



Figs. 1, 2 and 3.—Skulls from the National Museum showing variations of arch form. Photographed by Dr. Mitsuru Okada of Tokyo.

dimensions of the normal arch (from 90 to 150). In some normal cases the greatest width is but $^{9}/_{10}$ of the length, while in other normal types the width is $^{15}/_{10}$ of the length. All variations of arch form may be found in one and the same race.

Hrdlicka further states that he does not find in any of the larger groups any *single type of arch* which alone could be considered *normal,* and that it would be radically wrong for dentistry to try to reduce all dental arches to any one form or one set of dimensions.

And while the dolichocephalic skulls usually contain dolichouranic arches, still normal skulls may be found with the opposite form of arch to skull type.

Hrdlicka concludes by stating that in every race and even under most

normal conditions we find a variety of arches, and it will be the duty of dental surgeons to pay close attention to these facts before they can intelligently treat their patients.

It follows, therefore, that any plan of arch determination must be *flexible enough to produce arches varying in form* such as the ellipse, parabola, cubic parabola, "horse shoe," parallel sides, etc.

The plan must be flexible enough to produce arches varying in their relative length and breadth, within the range of variation exhibited by normal arches, i.e., $\frac{\text{length} \times 100}{\text{width}}$ shall vary between 90 and 150.

As orthodontists you are familiar with the appearance of normal dentures when viewed in the living or when reproduced in plaster casts. I have

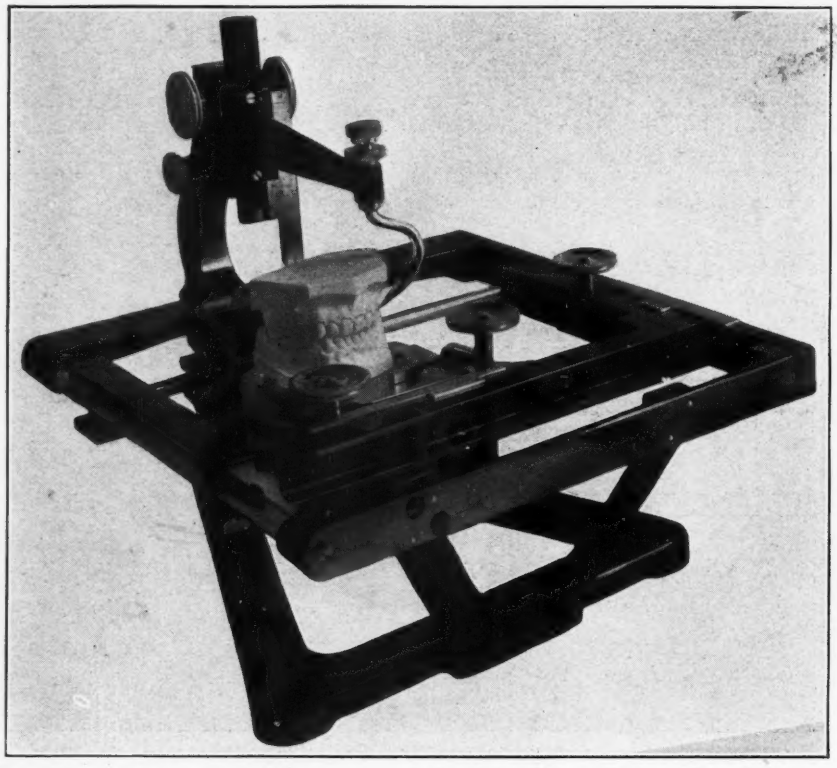


Fig. 4.—A new surveying apparatus designed by Gilbert Dudley Fish, C.E.

reviewed for you the viewpoint of the anthropologist by quoting from Hrdlicka's paper, "The Normal Dental Arch." I will now show normal occlusion, from the viewpoint of the engineer, as a problem of three dimensional space.

The following normal case was provided for study by your president, Dr. Eby. The usual orthodontic photographs of the model are first shown, together with photographs of the patient. (Figs. 5-13.)

Orthographic maps were made with a suitable surveying apparatus.

1. Horizontal map.
2. Right side elevation.
3. Left side elevation.

4. Front elevation.

5. Profile.

6. Vertical cross section incisal region showing horizontal and vertical overbite.

7. Vertical cross section through first molar region at mesiobuccal cusp lower first molar.

In a previous paper[2] the three reference planes have been carefully de-

Fig. 5.—Eby Case, front view.

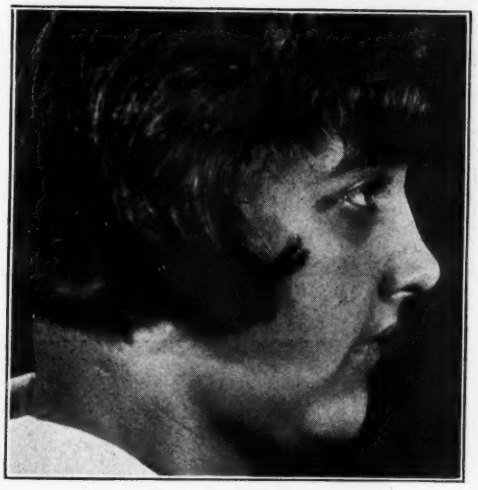


Fig. 6.—Eby Case, side view (right).

Fig. 7.—Eby Case, front view smiling.

Fig. 8.—Eby Case, front view showing occlusion.

fined. They are the *XY*, *XZ*, and *YZ*. For a proper understanding of arch determination the reader must thoroughly master the theory of these 3 planes as reference will be continually made to the planes by using their letters.

In Fig. 14 we have the upper (solid line) and lower (dotted line) teeth projected orthographically to the *XY* plane. (Plane of projection.)

This plane should be selected parallel to the occlusal plane as defined in a previous paper.[2]

In Figs. 16, 17, and 18 (left, right and front elevations) is shown the trace of the XY plane which does not bisect the overbite. In other words, the plane of projection was slightly tilted from front to back. This tilting can also be observed in side elevations (Figs. 15 and 16). This error in leveling would have no appreciable effect on the horizontal map. The maps were

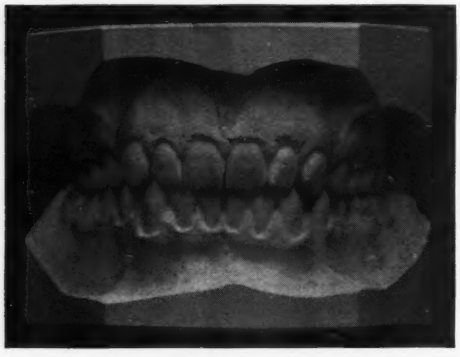


Fig. 9.—Eby Case, front view of model.

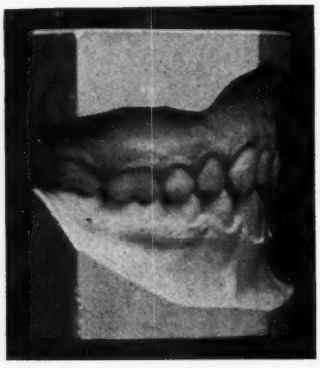


Fig. 10.—Eby Case, right side view of model.

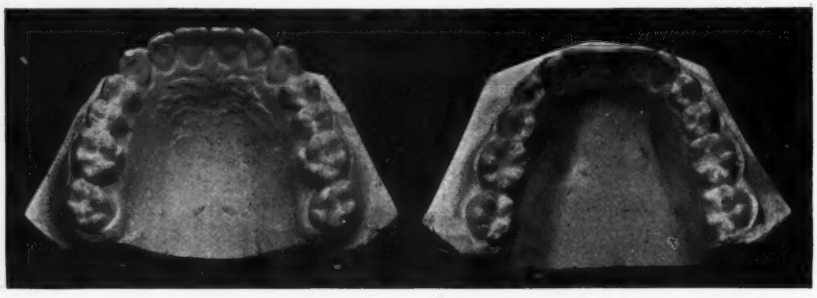


Fig. 12.—Eby Case, occlusal view of model.

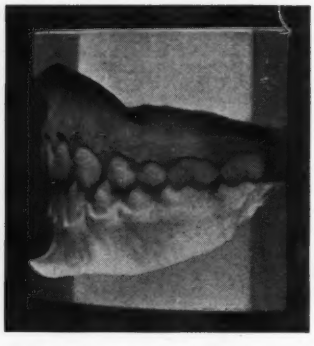


Fig. 11.—Eby Case, left side view of model.

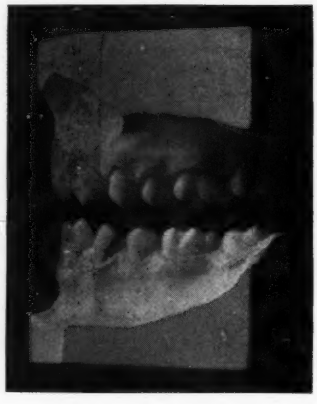


Fig. 13.—Eby Case, left side models apart to show the vertical curvature.

purposely left with this tilt in order to show how errors of leveling can be quickly detected and corrected. (Note, in models of malocclusion showing marked disturbances of the vertical curvature, the operator should select by the eye the best plane of projection and then quickly make a side elevation and superimpose over a normal side elevation. Any error of leveling can be corrected at this time.)

The centroids of the teeth are shown and the centroid of the denture at *O* calculated as described in a previous paper.[2] Also the axis of symmetry *A. B.* passing through *O.*

In Fig. 21 the vectors are drawn from tooth centroids to denture centroid at *O.* Table I compares teeth left side with corresponding teeth of right.

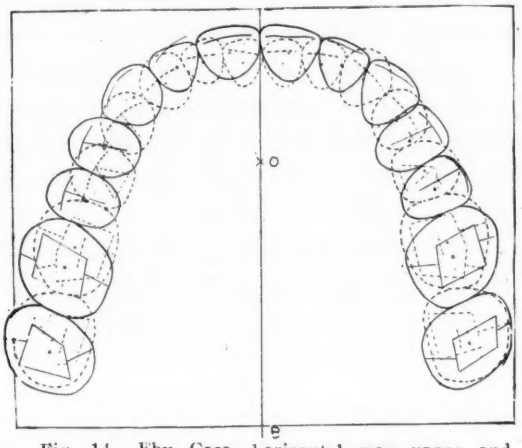


Fig. 14.—Eby Case, horizontal map upper and lower, uppers in solid line, and lowers in dotted line, axis of symmetry *A.B.* Centroid of denture at O.

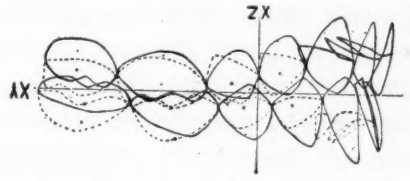


Fig. 15.—Eby Case, side elevation, right.

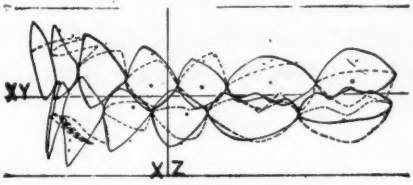


Fig. 16.—Eby Case, side elevation, left.

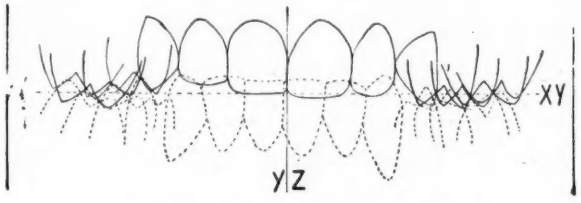


Fig. 17.—Eby Case, front elevation.

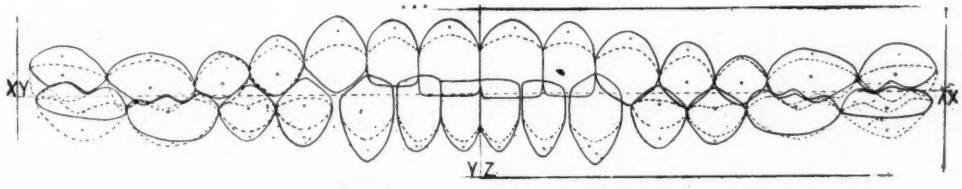


Fig. 18.—Eby Case, profile development.

TABLE I

ANGLE OF VECTORS		LENGTH OF VECTORS	
R°	L°	R	L
13.5	10.0	11.9 mm	11.8 mm
15.0	15.0	13.3	13.3
33.5	30.5	13.7	13.6
41.0	41.5	15.0	15.0
53.0	51.0	15.6	14.7
63.0	63.0	16.9	17.1
74.5	74.0	17.1	16.6
83.5	85.0	18.1	18.9
94.0	95.0	19.9	19.0
100.0	101.0	21.3	21.8
114.0	114.0	24.6	24.8
117.0	117.5	25.9	26.8
130.0	130.0	32.3	33.0
131.5	131.5	33.3	34.2

Note the remarkable symmetry, in the length and angle of the vectors in a normal case.

In Fig. 24 are shown lower teeth, gum outline, incisal edge, and cusp formation. *In normal occlusion there is a definite relation* existing between the incisal edge, cusp pattern, and the gum outline. This relationship is so definite that a student could be told to arrange the map of occlusion and copy the tilts of the teeth as exhibited by this map. The buccal cusps of the lower molars are three times as far from the outer gum line as the lingual cusps are from the inner gum line. This inward tilt of the lower molars may be traced through the various elevations. The degree of inclination is one of the most constant features of normal occlusion. The lower premolars partake of this lingual tip; this map could also be taken as typical of the norm.

In most races the relation of the incisal edge to buccal gum line is fairly constant. In the negroid or prognathous skulls the incisal edge may fall just outside the buccal gum line. Between these two positions the incisal edges

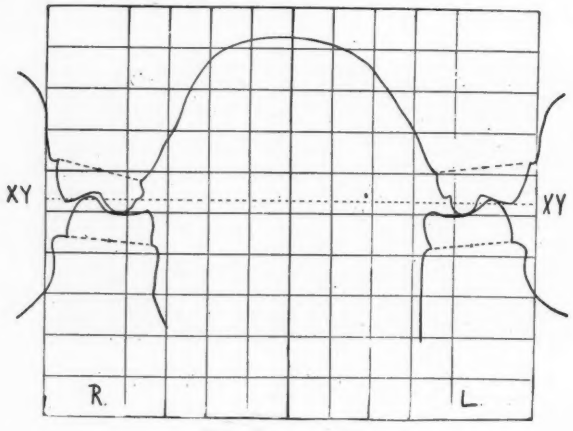


Fig. 19.

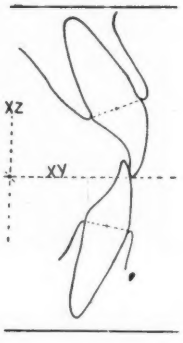


Fig. 20.

Fig. 19.—Eby Case, cross section parallel to the XZ plane through the mesio buccal cusps of the lower first molar.

Fig. 20.—Eby Case, section through the incisors parallel to the YZ plane showing the horizontal and vertical overbite (all points of crowns and gum are plotted by means of the surveying apparatus; roots are schematic).

in all types of skulls would fall. The orthodontist will agree that the teeth of this case (Eby case) are as vertical as the orthodontist ever sees teeth. (See Figs. 10, 11 and 20.)

In the average map the incisal edge should be placed on a lower incisor ½ mm. nearer the buccal gum line than in this case, Fig. 24. Fig. 25 shows the upper jaw, horizontal map. The upper molar normally presents a tilt opposite to the lower molar, the outer cusps appearing nearer to outer gum line than the inner cusps do to the inner gum line. *The amount of tilt of the upper molar is as constant as the lower molar tilt.*

When the upper premolars are normally tipped the outer and inner cusps appear an *equal* distance from outer and inner gum line.

The same rule applies to the upper incisor as to the lower. This case (Fig. 26) represents the extreme position lingually of a normal incisal edge and secretum apertum, the position of the incisal edge of a negroid skull.

In making maps of occlusion the type of skull should determine the inclination of the incisors. In the vast majority of cases (negro excepted) the incisal edge may be drawn $\frac{1}{7}$ of the distance (from buccal to lingual) from buccal gum line.

Lower $\frac{1}{4}$ the distance.

The slightest error of inclination can be detected in the horizontal maps by those who have learned the appearance of the normal. An examination of the models will show the occlusion to be more perfect on the left side than on the right. An examination of the upper horizontal map shows the second right premolar to be distinctly tipped outward. [Note relation of cusps to gum line (right second premolar) compared to the normally tilted premolar, second left.]

The upper left lateral is rotated on two axes as shown by the position of the incisal edge. The maps also show the right lower cuspid to be pushed out of the arch. So the reason of the poor occlusion on the right as compared to the left is readily recognized and understood as soon as the maps are examined.

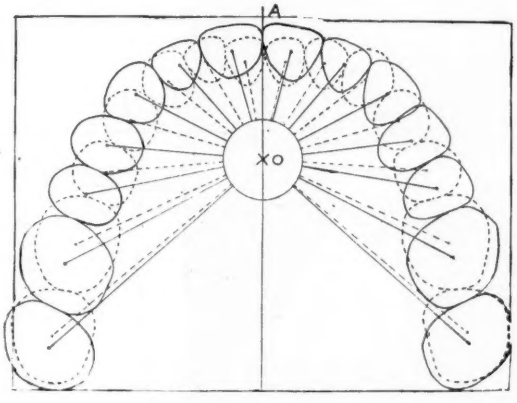


Fig. 21.—Eby Case, upper and lower "gum bodies" upper solid line, and lowers dotted line. Vectors connecting the tooth centroid with the centroid of the denture at O.

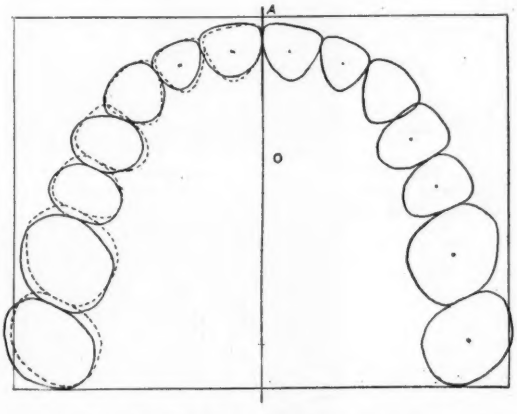


Fig. 22.—Eby Case, gum bodies of the upper solid line right side folded on left and traced over the left with dotted lines. Folding was done on the axis of symmetry.

In Fig. 23 the lower map has been folded on the axis of symmetry and the right side has been traced in dotted line over the left side showing a remarkable symmetry. (Note how lower right cuspid has been pushed out of line.)

Fig. 19 is a cross section of the teeth, palate and processes, through the mesio-buccal cusps of the lower first molars in a plane parallel to the *XZ* plane. (Note trace of the *XY* plane showing the models were correctly levelled from right to left. Slight error of leveling was from front to back only.) If the map be folded on the axis *YZ* the remarkable symmetry of the palate can be seen. The dotted axis of the lower molar together with tooth centroids fall exactly over each other when the right is folded over the left. *Recapitulation of features of normal occluson as found by engineering instruments.*

Outer cusps and incisal edges on a smooth curve.

Arch forms are on open and closed curves. Ex. Ellipse and parabola and kindred curves.

Most human arches vary but 5 mm. in width (one side).

Most human arches vary within 13 mm. in length (from buccal groove line to upper incisal edge).

Variation in width 52 to 62 mm. (buccal groove upper first molar taken on a line connecting mesio- and disto-buccal cusps).

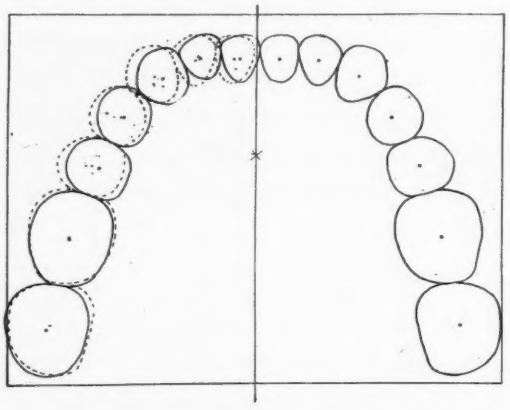


Fig. 23.—Eby Case, lower gum bodies solid line map folded on the axis of symmetry and teeth of the right traced in dotted lines on the left.

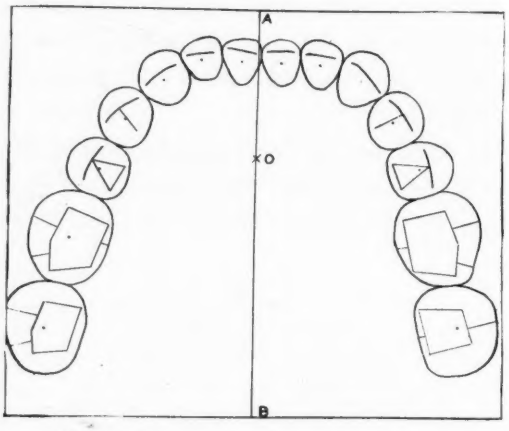


Fig. 24.—Eby Case, the lower teeth showing gum body cusp pattern, and grooves and incisal edges, to illustrate the tilts of normal teeth.

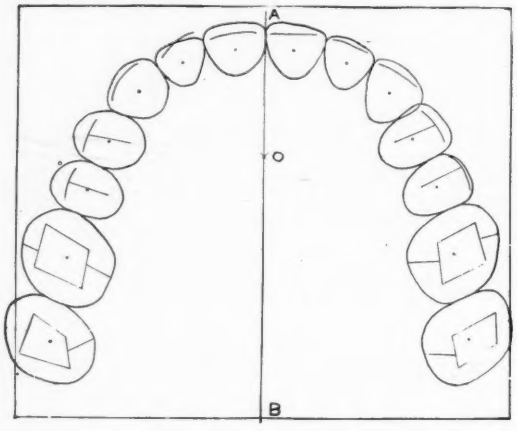


Fig. 25.—Eby Case, uppers gum bodies, cusp pattern, grooves and incisal edges, to illustrate the normal tilts of teeth first molars, left premolars, left central normally tilted, left lateral and right second premolar abnormally tilted.

Variation in length from 1 to 34 mm. These variations were noted from measuring normal skulls of widely different races including Eskimo, Negro, and Mongolian types.

In our predetermined arches (677) we have never gone beyond the range of variation in length. We have made them slightly narrower than 52 and slightly wider than 62. Constant relation of cusps and incisal edges to the gum figure guiding us to a proper inclination of tooth. We will now proceed, having briefly reviewed the previous art, to describe the technic of *arch*

determination, always bearing in mind the aforementioned data of orthodontist, anthropologist and engineer.

In May, 1905, *Cosmos,* Hawley wrote of the determination of the normal arch and based his plan on the Bonwill triangle. Hawley accepted the Bonwill triangle as correct and sought the aid of mathematicians to find the equilateral triangle when the size of the teeth is known. They gave him a correct formula if his premise (the Bonwill triangle) had been correct, but unfortunately Dame Nature never used an equilateral triangle to design

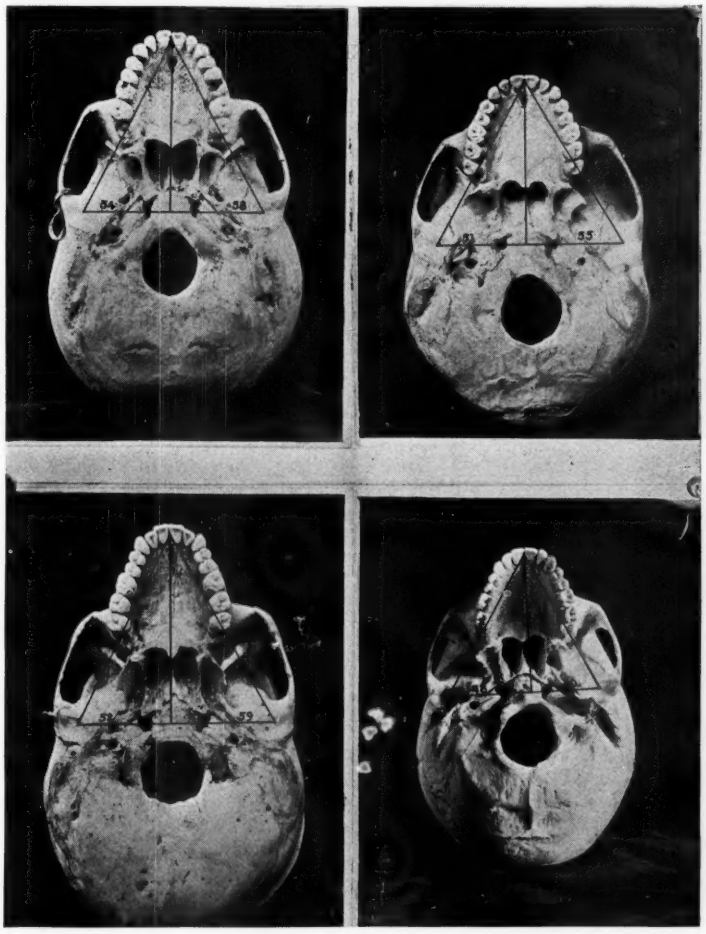


Fig. 26.

Figs. 26, 27, and 28.—Skulls from the collection of J. Leon Williams, error of the Bonwill theory graphically shown.

human jaws. In his Dental Anatomy Tomes speaks of "the fantastic theory of the late Dr. Bonwill that the form and relations of the jaws are referable to the developments of a triangle, does not call for serious discussion and it would not have been mentioned at all here had it not been unaccountably admitted in certain recent text books." Hawley should be given the credit of foreseeing the value gained by the orthodontist from accurate arch predetermination, but it is unfortunate that Hawley fell under the sway of the fallacious Bonwill triangle, especially as the Hawley charts have been widely used by orthodontists and orthodontic teachers.

The next three illustrations were loaned by J. Leon Williams and they graphically show the error of the Bonwill theory.

Fig. 29: on the right the largest and smallest Hawley arch (½); on the left a diagram showing the range of normal arch variation at buccal groove of first molar of 5 mm. and variation of the length of normal arches from buccal groove line of first molar to incisal edge 13 mm. (21 to 34 mm.). Note the Hawley arch is always the same inflexible form varying in size with the increase of size of teeth; Hawley's *shortest* arch is his *narrowest.* Note on

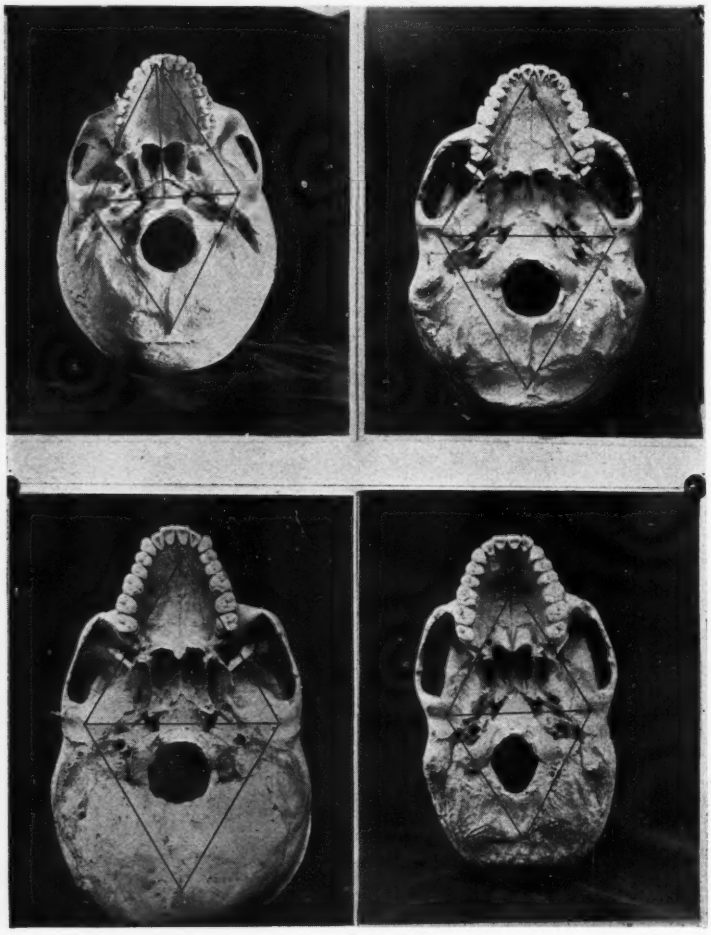


Fig. 27.

the left how the curves cross; the narrowest arch is the longest, and the broadest, the shortest. The dotted lines connecting the charts show the incorrectness of the Hawley Chart in plotting the positions of the centrals when compared with the wide range of these teeth in normal skulls.

The symmetroscopes of Gruenburg, Friel and others were the next great steps in measuring the symmetry of arches and later the Morse chart, a ruled grid on transparent celluloid, was found a great help to many orthodontists in testing the symmetry of dental arches. By far the most efficient method of predetermining arch form, devised by whom I do not know, is the sectioning of models and rearranging the plaster teeth in wax.

The Technic of Arch Determination.—The case selected to illustrate arch determination I have chosen from Dr. Dewey's clinic. It presents many interesting features not only for arch determination but also for map placement. In a previous paper[2] photographs of this model were illustrated. The first step in arch determination is to make a horizontal map (enlarged 10 diameters) as shown in Fig. 35.

Second step to mark the centroids on all the teeth and calculate the centroid of the denture which will be found at *O*.

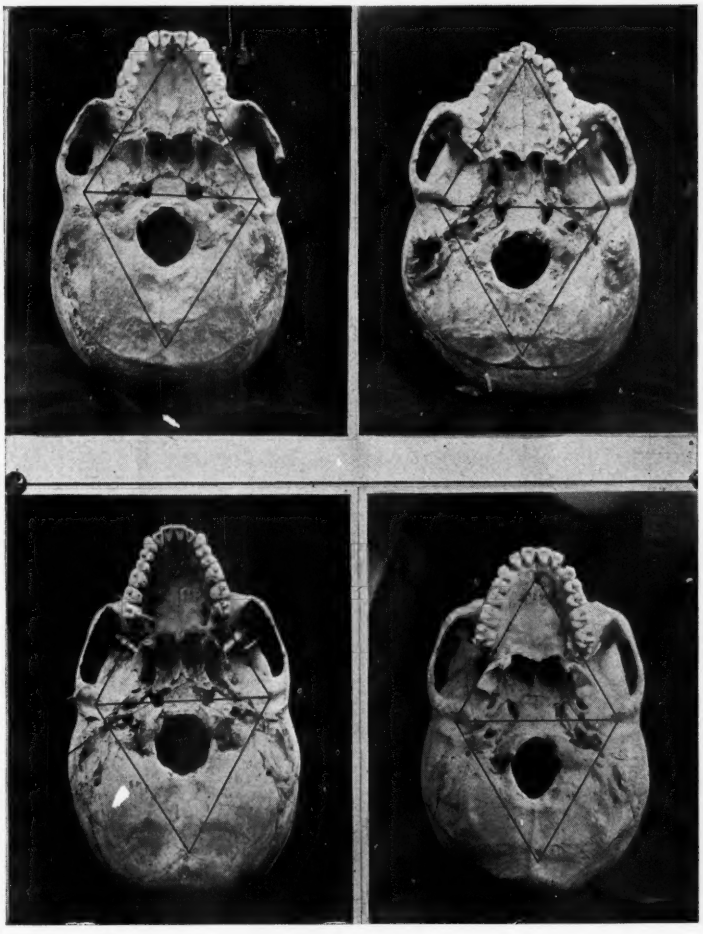


Fig. 28.

Third Step.—Apply the formula of "least squares" and find the axis of symmetry and trace on map the line *A. B.* passing through *O*.

Fourth Step.—Measure the mesio-distal diameters of the teeth, both on the enlarged map and by caliper measurements of the models (these measurements to be made at the point of contact. If the teeth are badly tilted and distort this line, the models should be placed on surveying apparatus and normally tilted for each tooth and individual maps made of all badly tilted teeth. Normality of maps to be judged by the criteria previously laid down in this paper for the normal tilts of all teeth).

Fifth Step.—Take a transparent sheet of paper ruled in 5 cm. squares and

place over the horizontal map, superimposing the center line of top sheet over the axis of symmetry.

Sixth Step.—Links of the occlusograph corresponding in number to the diameters are selected and connected by the occlusograph pins. We now have the upper and lower jaw unrelated. Individual maps of the upper and lower first molars are fitted together as shown in Fig. 37 and the contact lines are drawn as shown. A right angle connecting line is drawn from upper to lower at mesial of upper first molar. The length of this line determines the distance the upper and lower contact lines are apart and how much the lower molar contact is in advance of the upper when these teeth are in occlusion. This condition is now imposed on the occlusograph by selecting a suitable cross link and adjusting the sliding molar carriage to give the correct overlap of the first lower molar.

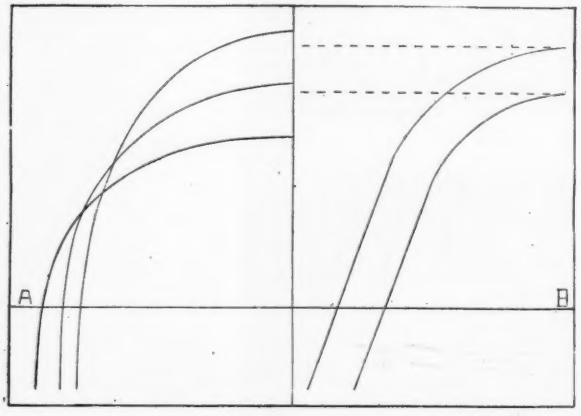


Fig. 29.—The line *AB* is drawn through the buccal groove of the upper first molars. On the right side is shown the largest and smallest Hawley arch. On the left a schematic drawing to show range of variation in the width and length of normal arches, the dotted lines connecting the two diagrams proving the inadequacy of the Hawley plan.

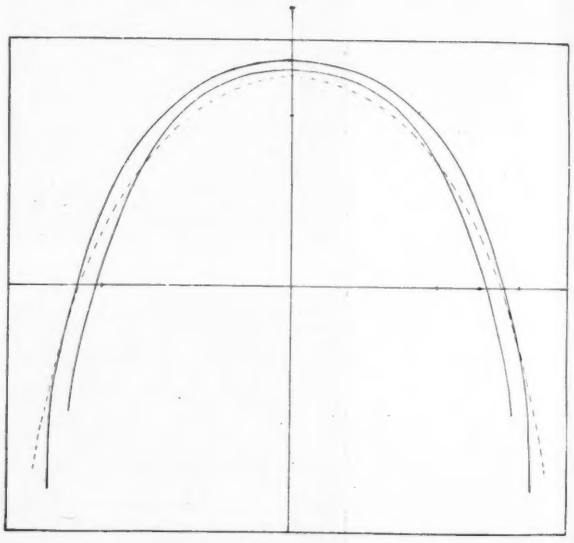


Fig. 30.—A comparison of the arch forms of Secretum apertum to Wilkes Case (dotted line) normal occlusion third (Eby case) inner solid line. The cross line represents the buccal groove line on which is marked the range of variation. The midline is the axis of symmetry. Range of variation of the length of arches is noted on this map.

Seventh Step.—Over the map of malocclusion place a sheet of transparent paper, ruled in 5 cm. squares, registering the midline of the grid with the axis of symmetry over the malocclusion map. Place the assembled occlusograph on top of both sheets, bringing the midline of occlusograph on the axis of symmetry in line with the contact line of the lower incisors over the map of malocclusion. Start and smooth out the occlusograph into smooth curves, using the grid paper as a guide for symmetry and attempting to keep the occlusograph as near the arch of malocclusion as possible, i.e., with the occlusograph lower incisors over corresponding teeth on malocclusion map, try to hold the nearest width, in the second molar region, compatible with normal occlusion. Complete the manipulation of the occlusograph by establishing occlusion in the canine, premolar and molar region, by bringing the cusp

points of each jaw (on the occlusograph) opposite the points on the opposing jaw, that they should occupy in normal occlusion.

If the tooth material of the upper will not stretch around the lower (this

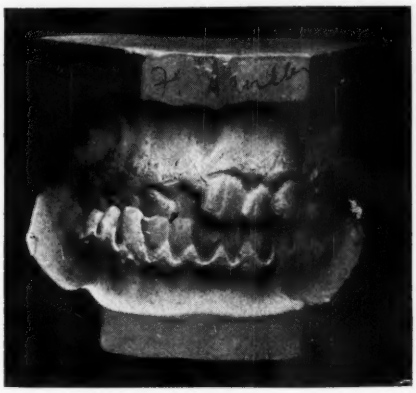


Fig. 31.—Dewey Case, front view of model.

Fig. 32.—Dewey Case, right side of model.

Fig. 33.—Dewey Case, left side of model.

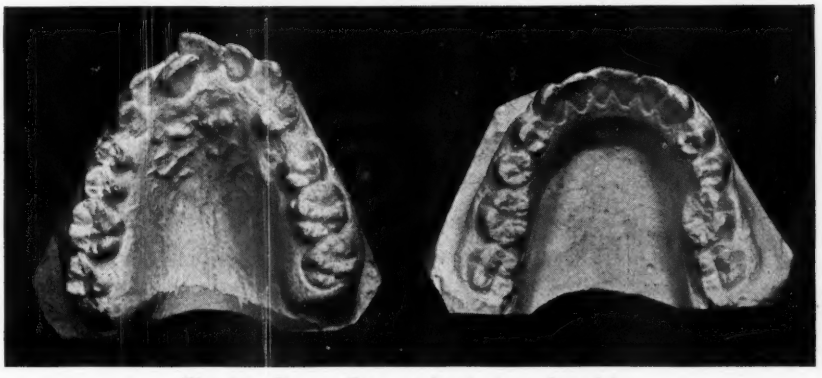


Fig. 34.—Dewey Case, occlusal view of model.

will happen in the majority of cases) the upper occlusograph should be broken at canine and first premolar contact. With this increased flexibility, smooth out the lower into a smooth curve and make the upper premolars and

molars fit, creating small spaces between the upper front teeth. If the proper fit of molars will not give good occlusion in premolar and canine region, then loosen the molar carriage and move the upper molars back on the side and get occlusion of premolars and canine and slight distal fit of the upper first molar. This will create slight spaces between the 5 anterior upper teeth. If the expansion is extreme or for any reason little tooth movement is desirable

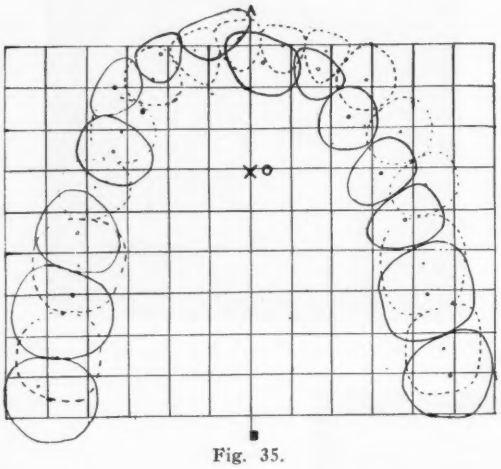


Fig. 35.

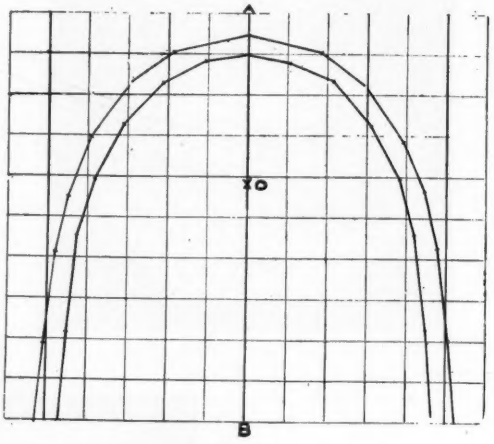


Fig. 38.

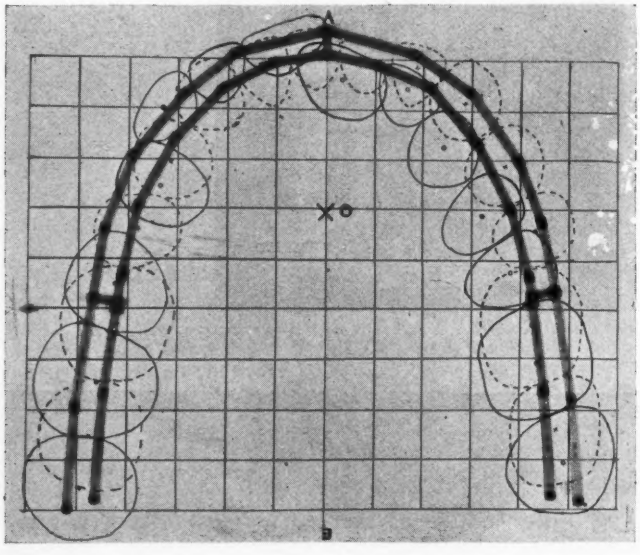


Fig. 36.

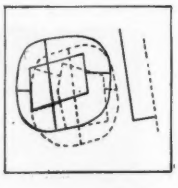


Fig. 37.

Fig. 35.—Dewey Case, horizontal map upper and lower. Uppers solid line and lowers dotted line. *AB* axis of symmetry. Centroid of denture at O.

Fig. 36.—Dewey Case, the occlusograph superimposed over horizontal map of malocclusion.

Fig. 37.—Dewey Case, maps of first molars upper solid line, lower dotted line showing the normal fit of these molars. Diagram to show the arrangement of the occlusograph links, to produce normal occlusion of these teeth.

Fig. 38.—Dewey Case, occlusograph line as predetermined by using the occlusograph.

the lower canines can be left rotated and with a slight overlapping of the lower incisors, the arch width can be materially decreased, good occlusion of the side teeth obtained with regular upper front teeth.

After the occlusograph has been arranged in the best symmetry and the

best occlusion for the case has been found, pins should be passed through all of the occlusograph joints, appearing over the map of occlusion as Fig. 36 (note the transparent ruled sheet has been removed in order to photograph occlusograph in relation to map of malocclusion).

The pins are now removed and the pinholes connected by lines, Fig. 38, giving a form (contact line) on which the teeth may be drawn and a test made to see whether occlusion has been predetermined (note this test is made on drawing board and not on the patient).

The map of occlusion, with its drawn contact lines, is slid over the map of malocclusion registering the contact line of the lower incisor. The gum outline of this incisor is traced on the occlusion map. Proceed tooth by tooth on the lower until all of the lower teeth are arranged, with proper tilts on the occlusion map.

The uppers are similarly treated, starting with the upper first premolar, Fig. 39, fitting its cusps accurately between the lower premolars. Proceed

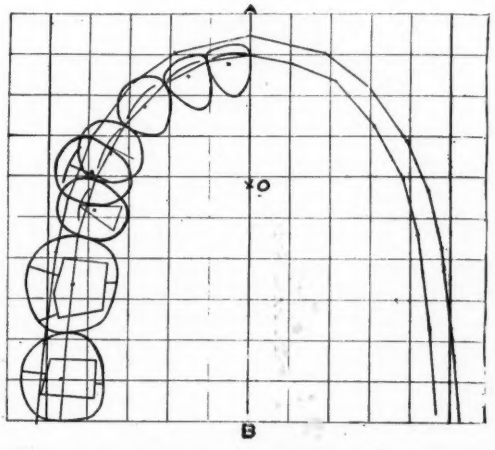


Fig. 39.—Dewey Case, showing how the teeth are drawn in on the occlusograph line by superimposing the normal map over the map of occlusion by individually registering each contact line.

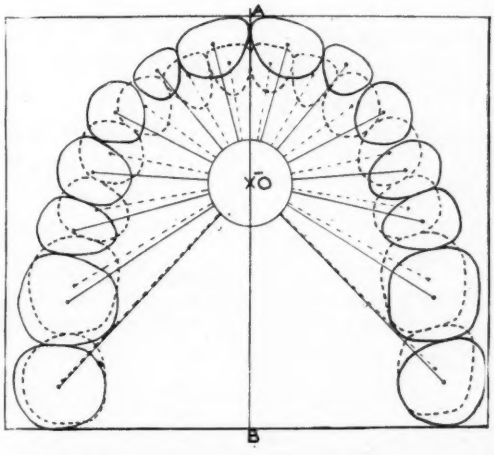


Fig. 40.—Dewey Case, completed map of occlusion *AB* axis of symmetry centroid of denture at O, vectors connecting tooth centroids with the denture centroid, upper solid line and lowers dotted lines.

tooth by tooth until the occlusion map is complete. If any error has been made in arch determination it will be impossible to draw the teeth on the contact line of the occlusion map. It is much pleasanter for orthodontist and patient to find errors of arch determination before treatment of living tissue is begun.

The completed map of occlusion will appear as Fig. 40.

The centroids of the teeth should be traced from the map of malocclusion onto the map of occlusion. The centroid of the denture will be next calculated in the same way as the centroid of malocclusion and will appear on the midline, if the teeth of the right and left are symmetrical; if they are not symmetrical then the axis of symmetry must be computed for this map.

The second division of this paper deals with map placement, to produce the minimum movement, to change from malocclusion to occlusion.

As far as I know, no one has ever written on this subject. The solution

required six years of work in consultation with three engineers. It is with great pride that I bring to you a simple and easily applied formula.

As early as 1914 maps were related by ocular inspection and this seemed sufficient until more complicated malocclusions were examined and it was found that different workers in the office would make different placements. This of course would materially affect the proposed treatment.

Formula for map placement:

Pass a pin through centroid of occlusion map and register with centroid of malocclusion. Rotate map of occlusion until the axis of symmetry on occlusion map registers with the axis of symmetry on malocclusion map.

After the maps are related registration marks should be made at three or four convenient points and individual maps of upper and lower jaw made, showing the upper crooked teeth related to their proposed normal positions and the lower crooked teeth related to normally positioned teeth of the lower.

We will examine the treatment sheets of the Dewey case shown in Figs.

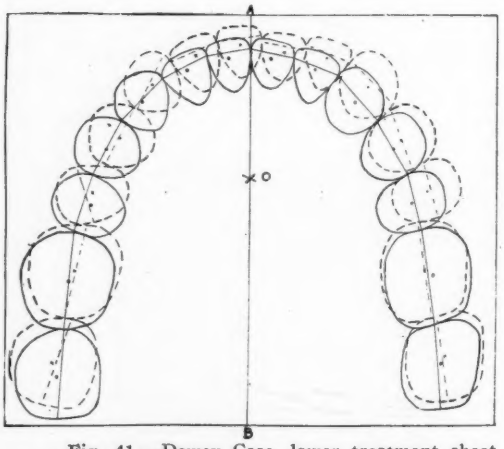


Fig. 41.—Dewey Case, lower treatment sheet showing the minimum tooth movement, occlusion solid lines and malocclusion dotted lines.

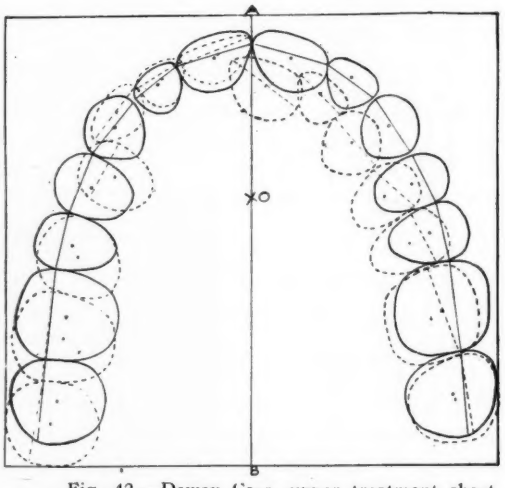


Fig. 42.—Dewey Case, upper treatment sheet showing the minimum tooth movement to change from malocclusion to occlusion; solid lines normal occlusion, dotted lines malocclusion.

41 and 42. These two maps of the upper and lower were made strictly according to the prescribed formula.

1. Horizontal map of malocclusion was made.
2. Centroids of teeth and denture were calculated.
3. Axis of symmetry computed.
4. Horizontal map of occlusion was made.
5. Centroids of teeth and denture were calculated.
6. Axis of symmetry computed.
7. Maps related by registering centroids of dentures (on occlusal and malocclusal maps) together with the axes of symmetry.

Note how well the axis of symmetry formula placed the midline.

On the lower jaw, Fig. 41, the premolars on the right were driven by the upper jaw outward and forward, causing the incisors and midline to shift to the right. This allowed the left side teeth to move forward. The left cus-

pid moved toward the midline ⅓ of its width with the consequent forward movement of the back teeth on the left side. The left lower second molar is rotated and it is obvious that is the first tooth to be treated in order to gain space for all of the teeth in front of it. The map clearly shows the center around which the second molar can be rotated into normal occlusion (mesio-lingual angle).

On the upper treatment map (Fig. 42) the effect of the retained second deciduous molar is shown in the increased length of the arch; this is further accentuated by the erupting second premolar opening a space between the first premolar and second deciduous molar.

CONCLUSIONS

1. Easily applied formulae for
   (1) Arch determination
   (2) Axis of symmetry determination
   (3) Map placement

should be of great service to orthodontists in planning treatment.

2. The mathematical approach to our specialty has shown the errors of classifications and terminology.

3. The methods indicated in this paper should lead to radical changes in undergraduate and postgraduate orthodontic courses.

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DISCUSSION

Dr. Martin Dewey, New York City.—It is rather difficult to discuss this paper in the length of time we have allotted to it, and owing to the fact that there are many points that have a bearing on this subject which we can hardly mention at this time. Probably a résumé of the opinions the dental profession have held in regard to arch predetermination may not be amiss.

If you go back to the paper of Dr. Howard, you will find in that paper certain conditions were raised which to a certain extent are also met with in this paper. When we speak of and attempt to classify types of malocclusion we have been accustomed, first of all, to get a certain amount of knowledge from the study of the model. That is one way. Dr. Howard brought out the fact that we get more information by studying the facial outline. Dr. Howard spoke of tipping of molars laterally in connection with expansion of the arches, but he gave us no idea as to how much he tipped the molars or moved them laterally; or whether he moved them bodily, because with the ordinary methods of diagnosis, study of the models, study of the face, and study of the models before and after treatment, it is difficult to arrive at a definite conclusion as to whether these teeth are tipped or moved bodily because there is no way of determining, without making a survey of a set of models, as made by Dr. Stanton. With the survey you can pick up errors and deviations from the normal that you can hardly detect with the eye as you study the model, because survey of the model is made in three dimensions and two of these measurements are translated on a flat surface.

One of the difficulties which I encountered when I began looking over Dr. Stanton's investigations and studies was that it took some time before I could interpret them correctly. The markings on the piece of paper gave me little information first, and I dare say gave

little to you. You must become accustomed to interpreting two dimensions on a flat surface by the plane of projection. However, that is no discredit to you because it simply indicates you have not had experience in that line.

If any of you who have not studied objects under the microscope to any great extent and are interested in histological investigations, if you go into a man's laboratory who is doing histological work and he looks at a specimen, he sees a great many things that you cannot see. The histological investigator learns to interpret the histological specimen through the microscope straight up and down. However, he gets his measurements laterally and his dimensions in different directions which you do not see. That was illustrated by Dr. Bast in his paper on the study of bone cells in which he described the condition he saw microscopically, and I have no doubt that many of you were not able to follow him.

When you listened to Dr. Stanton today you must remember he gave you interpretations he had learned as a result of studying this thing with trained engineers, and those engineers have spent their entire education in studying maps.

This proposition of surveying the dental apparatus gives us information and makes our vision clearer. You see things much quicker than you would do otherwise.

When I went to Dr. Stanton's office after he was working on the establishment of maps according to the plan he has outlined, I confess that, at first glance, it seemed too simple. I did not think it would work. I had my doubts about it, but any scientific fact must be tested and confirmed. We want the results of several hundred experiments and substantiated facts before drawing conclusions. Dr. Stanton has been doing the work he has outlined to you for many years.

I got the model which you saw on the screen, which was a rather complicated case of malocclusion. I had seen some of the things on that model, and I had outlined a plan of treatment which corresponded very closely to what he showed you on the map, but I must confess that the extreme degree of accuracy with which these teeth must require movement had escaped my attention. After studying the model for a long time, the map gave information and I had a clearer insight than I had obtained before.

I have many times said that dental surveying or arch predetermination as practiced by some dentists was unsatisfactory, and that is because the general plan of arch predetermination is to consider all arches of the same shape. If you study many cases you will find that arch forms are not of the same shape any more than tooth forms are of the same shape. Any plan of arch predetermination that is not flexible, that does not allow you to make arches of different shapes is unscientific. You have heads and you have teeth of different shapes.

Dr. Howard said the other day that he did not believe that we could make a dental survey and get supra- and infra-version. The determination of infra-version has crept into orthodontic literature and we did not know what we were talking about. We have to use different terms for infra- and supra-version.

A few years ago I was trying to get you to use the terms infra- and supra-version; now I am telling you to forget them and learn something else. In other words, you probably think I do not know what I am talking about again, but you remember the late Elbert Hubbard was quite a noted lecturer and popular speaker, and sometimes advanced unusual ideas. After hearing a lecture a lady went to him and said, "Mr. Hubbard, I don't agree with everything you have written. I don't believe it." Mr. Hubbard replied, "I don't either, but I did at the time I wrote it." And that is the way with reference to supra- and infra-version. They seemed like good terms at the time we advocated them, but since studying cases from an engineering standpoint these terms are incomplete.

Dr. Abell used the terms supra- and infra-version, but later on he said up and down. That is what you get by studying these maps and surveying the dental arches. You consider tooth movements as anterior and posterior, and you also consider up and down.

You have three planes to consider in tooth movement, one laterally, another anteroposteriorly, and a third up and down. That goes back to the proposition, are we going to gain anything from arch survey as regards "ups and downs" as applied to the plane of

occlusion? We can as regards the relation of the incisors to the molars. When we consider the tipping relation of the teeth which my good friend Howard did not consider and talk about expanding the arch to move the teeth out, he did not say whether he tipped them or moved them bodily, but in checking up results and in making surveys of progress, we can go a little farther in regard to the up and down of arch relations. Engineering methods hold out the possibility of absolutely determining the position which the dental apparatus occupies in the face. It is possible for engineers to analyze and locate the dental apparatus in its relation to the face. That is what Dr. Howard wants, and that can be done by engineering methods.

Dr. Stanton has prepared with the aid of Mr. Fish a complete set of drawings, to construct such a surveying apparatus. The unfortunate thing about it is that it is rather expensive, but instruments can be designed for a certain thing by engineering methods and successfully used and they might not need much improvement in later years.

Dr. Barnes' paper the other day was a masterly contribution which consumed two and a half hours in its presentation. He very often spoke of arch predeterminations and showed cuts made from measuring six central incisors. That will not work because you are only taking one group or case and making the other group the same width without regarding the the shape of the teeth or the shape of the teeth in the opposite arch. With Dr. Stanton's plan he is able to measure every tooth correctly. He can determine the contact line of the individual teeth and the arch design by the occlusograph which is built on mechanical principles as governed by engineering facts, enabling one to estimate a certain shape without changing the lengths, because they have got the anatomical relation of the molars, especially as regards the anterior position of the mandibular, and the rest of the teeth are set in the occlusograph to the proper mesiodistal diameters. Tooth substances cannot be changed in an arch.

Another thing he showed me several years ago as regards the occlusograph was that if you should happen to have a case in which your diameters "mesio-distal" of the mandibular molars and premolars are slightly smaller in comparison to the mesio-distal diameter of the maxillary molars, in such a case the arch tends to take a circular form. The posterior end of the arch curves in and you cannot make the thing fit in any other way. If you have the opposite condition, where the mandibular molars are wider mesio-distally than the maxillary molars, you will find you have one of those arches in which the posterior part turns out. These are things which have been proved and are not guesswork. Dr. Stanton starts out to survey an arch with no preconceived idea. He does not know what the arch is going to be after the thing is made until he has completed the survey.

Going back to the point of referring to the construction of an instrument with which it is possible to measure the position of the teeth and the position of the dental arch and cranium, and make measurements so that we can move the molars up and down, I believe such an instrument can be constructed, as has been done in other lines. I refer to astronomy.

Several years ago when I was in California I visited the Lick Observatory. One chap in that observatory has charted the orbit of 14,000 different stars. When we talk about the orbit of stars we do not know a thing about it; nevertheless astronomers can do it and have done it for a long time, because astronomy is the oldest science known. Also, at that observatory they have a large instrument, and some man has spent years in seeing whether the sun crosses over the earth in the right position every noon. His work is to locate the sun every day at noon and its relation to things. And the instrument he uses was built forty-five years ago. It was the first instrument of its kind constructed and cannot be improved upon today. They knew what they were doing. They made use of certain engineering methods in astronomy by which they were able to construct this instrument. Strange as it may seem, I am convinced that an instrument can be made which will actually locate the dental apparatus in the cranium to the satisfaction of Dr. Howard, although it may sound like a far-fetched statement.

I hope some time we can get the Society sufficiently interested to have such an instrument constructed, because the expense is going to be too much for even a man like Dr. Stan-

ton to bear. If the Society is interested in scientific investigation, I believe it could do nothing better.

Dr. Stanton has only just started on this work. What he has done gives us knowledge that cannot be obtained in any other way, and a proper survey of the dental apparatus, measured in three dimensions, gives us information that we cannot get anywhere, as even the photograph only gives you one phase of it. However, if you take the model, the photograph, and an occlusograph map, you have obtained information you cannot get by any other means at present, until we design an instrument and make a survey of the dental apparatus and cranium which I hope this Society will assist in having perfected at no distant date.

Dr. Stanton (closing).—This has been a very unusual experience for me. I have been dodging practice for the last six or seven years from all directions, and I hardly know what to say. This discussion has been extremely agreeable, and it is the first time I have felt at home in an orthodontic society for many years. As I would go to the leaders of societies with my work, men would walk away and refuse to talk to me. I have been enthusiastic about this work, and I have given enough evidence to show that there is much in what I have said from an engineering viewpoint.

I did not touch on the designing of appliances. I have brought treated cases showing the devices that were in use before orthodontic treatment was undertaken, and I have pointed out how easy it is if you have a map to see what it is necessary to do, and the necessary mechanical device will suggest itself to your mind.

I will give you a further demonstration of what I have been talking about tomorrow, or I shall be glad to meet any of you in my room, for if I can maintain friendly relations with you, I am certainly going to do it. I thank you.

TREATMENT AND RETENTION OF DISTOCLUSION CASES*

By Joseph E. Johnson, Louisville, Kentucky

BEFORE taking up the actual treatment of distoclusion cases I will go into the technic of making the appliance.

Fig. 1 shows the method used in making my molar bands. The bands are made of irrido platinum .007 of an inch thick and 3/16 of an inch in width. They are made with a loop the size of a 16-gauge bar as shown in Fig. 1 *A* and *B*. The loop eliminates the necessity of having a large number of different size bands on hand.

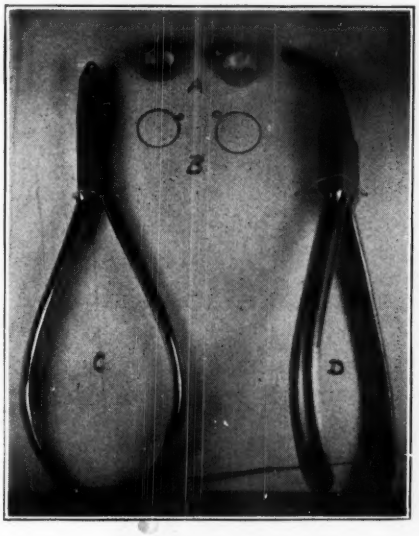

Fig. 1.

Fig. 2.

As the band is pressed down on the tooth, the loop spreads apart and permits the band to slip into place.

The bands are made in the following sizes: 1.32 inch, 1.40 inch and 1.48 inch in circumference. These bands will fit any size tooth. They are made with a flare; that is, they are 3/64 of an inch larger at the bottom than at the top.

The band is drawn around the tooth with the pliers *C* and *D*, one for the right and one for the left side.

In the beaks of the pliers is a 16-gauge groove which fits over the loop on the band. The band can be drawn around the tooth very tightly by this method; in fact, care must be used or the band will tear in two.

After the band has been drawn together and burnished to the tooth, it is then removed and soldered. The bands are now replaced on the teeth and

*Read before the twelfth annual meeting of the Alumni Society of the Dewey School of Orthodontia, Chicago, Ill., April 27-28, 1922.

a modeling compound impression is taken. No doubt you have noticed that you can get a good modeling compound impression except on the labial sur-

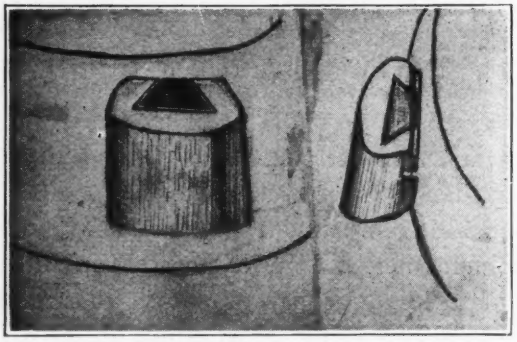

Fig. 3.

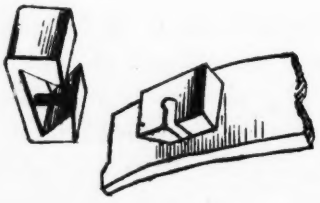

Fig. 4.

Fig. 5.

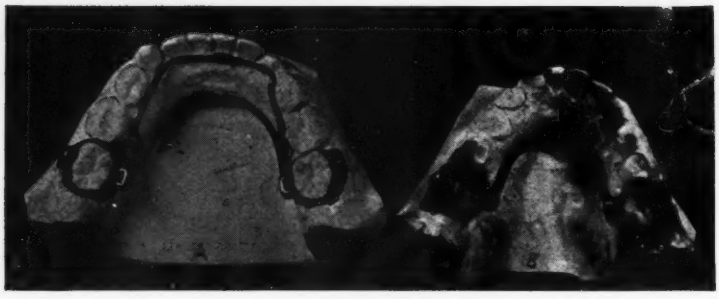

Fig. 6.

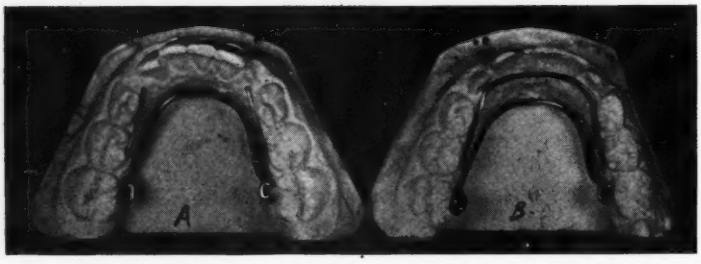

Fig. 7.

faces of the maxillary and mandibular six anterior teeth and the lingual surface of the lower molars. This is due to the angle of inclination of these

teeth to the modeling compound as it is pressed into place, and since modeling compound does not flow like plaster, you get a poor impression of the surfaces of these teeth.

In Fig. 2 the anterior rim of the two trays has been cut away, also the lingual flanges of the lower. These alterations of the trays enable you to adapt the modeling compound to the teeth with your fingers. If the compound is chilled thoroughly before removal you will find you will have a

Fig. 8.

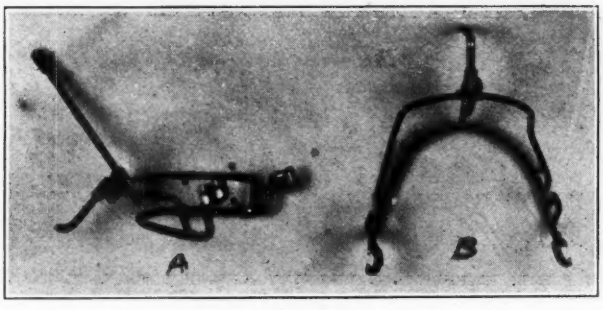

Fig. 9.

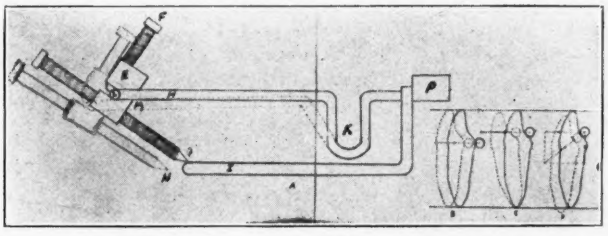

Fig. 10.

very accurate impression. S. S. White Base Plate Compound is used in taking the impressions.

In taking the lower impression, the patient is instructed to raise the tongue as high as possible so as to get a good impression of the lingual frenum. The importance of this will be shown later.

Fig. 3 shows the lingual lock. I described this lock in a paper at our 1920 alumni meeting, so will not go into detail.

Fig. 4 is an improvement on the lock just shown, as it eliminates the use of the locking pin. The slot in counter lock *A*, Fig. 4, is cut at a slight angle

with an undercut at the bottom. When the lock *B*, Fig. 4, is fitted into place on the counter lock, the pin in *B* slides into slot in *A* and snaps into undercut, making it a very rigid lock. This is a more satisfactory lock than that shown in Fig. 3, but it is more difficult to make and I do not use it much.

Fig. 5-*A* shows the model with the bands on it. You will note that the lap on the band has not been cut off. This is left on until the appliance is finished so that attachments can be soldered to band with no danger of unsoldering them.

Fig. 11.

Fig. 12.

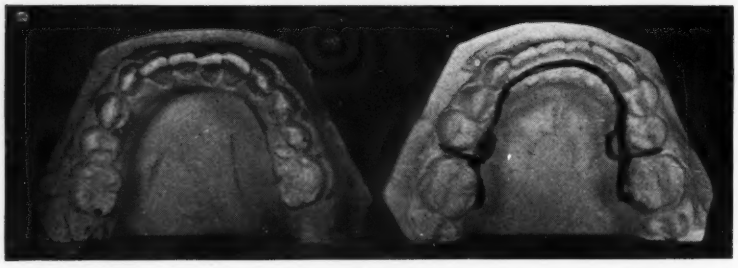

Fig. 13.

I break the banded teeth off the model and remove the plaster from the bands and solder counter lock to bands. (Fig. 5-*B*, right band.)

The counter lock is painted with chalk and the lock is slipped on. (Fig. 5-*B*, left band.) I paint the counter lock with chalk to prevent the two from being soldered together.

The body of the appliance is made of 16-gauge wire. It is adapted as low in the floor of the mouth as possible, care being taken that it does not impinge on the lingual frenum or soft tissues as Fig. 6-*B*.

Fig. 6-*A* shows completed lower appliance. The arms of the appliance are made of 19- or 20-gauge wire; the gauge depends on the case.

Before the appliance is polished it should be thoroughly tempered.

The appliance is assembled and cemented on all at one time; then the locks will slide off and on easily. The patient is dismissed for a week and then the upper appliance is made. Figs. 7 and 8 show the different forms of lower appliances used.

Fig. 7-*A* shows the appliance I usually use when starting a case, espe-

Fig. 14.

Fig. 15.

Fig. 16.

cially when there is to be a great deal of widening of the arch. After I have widened the arch sufficiently, I change to one of the other types of appliances shown.

If the six anterior teeth must be pushed forward just a slight bit, I use appliance *B*, Fig. 7.

I have used appliance *B*, Fig. 8, on most of my cases and have found it very satisfactory but it is mostly guess work to determine how much pressure you are exerting and the direction in which the force is exerted. So on my

later cases I am using appliance *A*, Fig. 8. Force is exerted with the appliance by opening the loops.

For the sake of clearness, where the arms of the appliance are soldered together, as in Fig. 8-*A*, we will call it the lingual bar.

I have a simple little instrument (Fig. 9) by which I can tell the exact

Fig. 17.

Fig. 18.

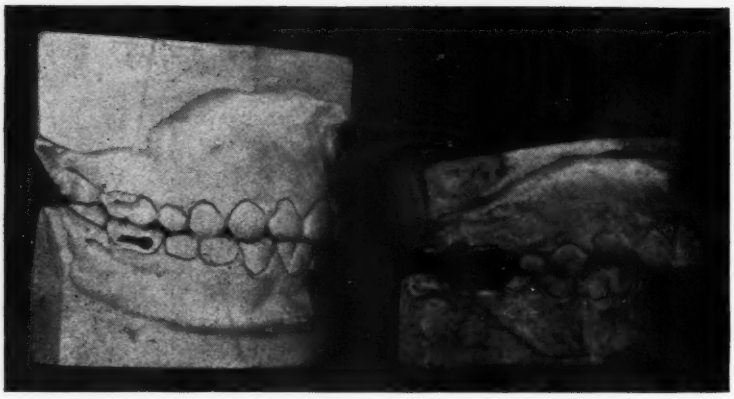

Fig. 19.

amount of force produced by opening the loop and the direction in which it is applied.

Fig. 10-*A* is a drawing of the instrument from which I will explain how it is used. The lingual bar, *H*, of the appliance fits in slot *L*, the bolt *F* is screwed down until it grips the bar *H* in slot *L* and holds the instrument rigid on the appliance. Then bolt *G* is turned down until it rests on top of body wire *I*.

By opening the loop *K*, the lingual arch, *H*, can move in one of four directions: up or down, forward or sideways, or it can move in three directions from one pinch of the loop *K*. That is, downward, forward and sideways. In the drawing we will suppose it has done this, then the lingual

Fig. 20.

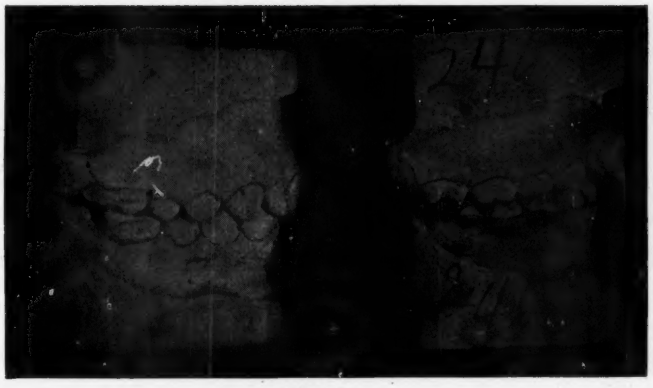

Fig. 21.

Fig. 22.

wire *H* will take the position of the dotted lingual wire *M*, the bolt *G* will take the position of the bolt *N*. The distance from the point of bolt *G* to the point of bolt *N* will show how far it has moved and in what direction. Without this instrument I do not think it possible to tell what your force is, or in what direction it has been applied.

One of the most important things in the working of the appliance, is the position of the lingual wire on the surface of the mandibular anterior teeth.

In Fig. 10-*B* is shown the correct position of the lingual wire when you wish to move the teeth forward without depressing or tipping them.

Fig. 10-*C* shows the incorrect position of the lingual wire if you wish to

Fig. 23.

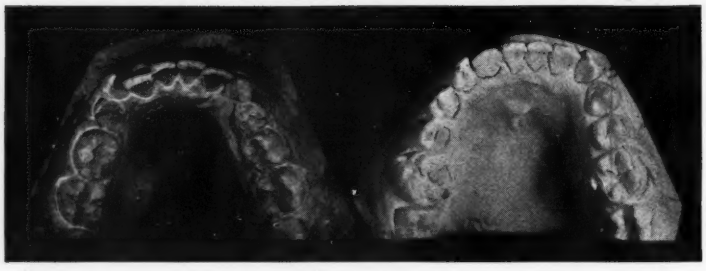

Fig. 24.

Fig. 25.

push the teeth forward. The wire in this position will tend to tip and depress the teeth as they move forward.

In a great many instances in treating distoclusion, we find we wish to depress the anterior teeth as we move them forward.

Fig. 10-*D* shows the position that the lingual wire should rest on the teeth. The force should be forward and downward.

Fig. 11 shows a case where the arch has been widened and the six anterior teeth have been moved forward into the normal position.

The arms of the appliance have been soldered together and the body wire removed. The case is now ready to have the loops soldered to the bar to move the first premolars forward into their normal position. These loops are made of 22-gauge wire.

Fig. 26.

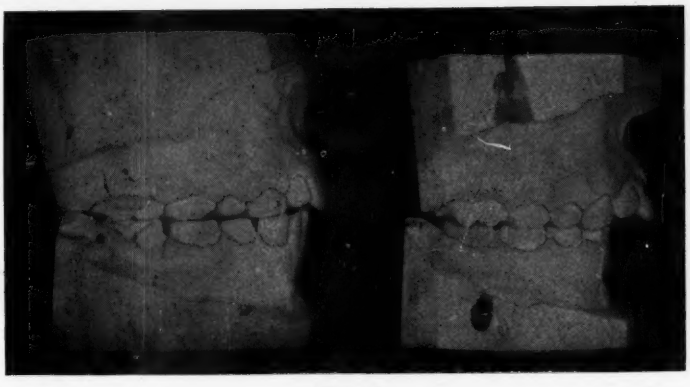

Fig. 27.

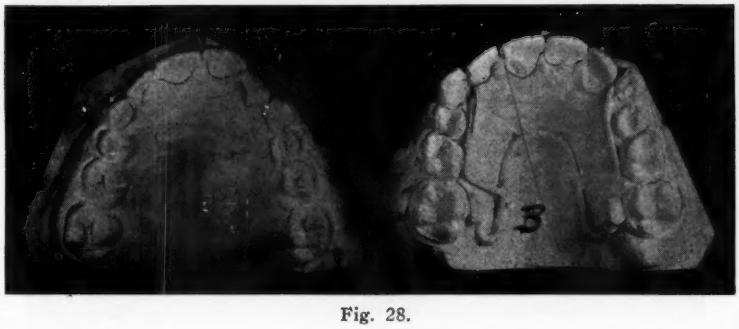

Fig. 28.

In Fig. 12 we have a case in which the first premolars have been moved forward. When I shift the loop back, to move the next tooth forward, I always solder a spur onto the bar to hold the teeth that I have moved, in position.

Fig. 13 shows the mandibular teeth after the second premolars have been moved forward. When the case has reached this stage of treatment, I usually let it rest for at least six weeks to let the teeth settle into their normal occlusion and to give Nature a chance to build bone around them.

The lingual arch is then removed to let the intermaxillary rubbers move the molars forward into position.

The hooks on the molar bands should be as far forward as it is possible to place them or there will be a tendency to rotate the molars inward. It usually takes about a month to move the molars forward and very seldom do

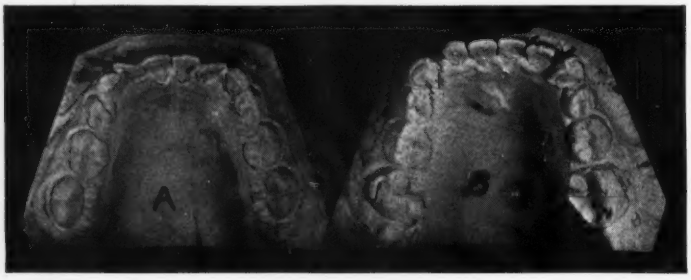

Fig. 29.

Fig. 30.

Fig. 31.

I find any drifting of the premolars backward. But if this should occur, the pull on the molars should be continued until the premolars are back into their normal position.

The lingual arch is then readjusted and used as a retainer (Fig. 17).

We will now take up a case of unilateral distoclusion. I used to find these cases much harder to treat than the bilateral, and in some instances almost impossible to bring the distal side forward into normal occlusion. By

the method I now use, I find they are about as easy to work as the bilateral cases. The anterior teeth are pushed forward as already described, the arms are soldered together and the body wire is cut out as in Fig. 14-*B*. You will notice on the right, a finger attachment, with which the canines and premolars are moved buccally.

At the same time with finger spring posterior of left lateral or left canine as in the figure, the anterior teeth are shifted over and the premolars are brought forward as in Fig. 15. And then the molar is brought forward as in the bilateral cases.

We will now take up the treatment of the upper arch. Fig. 16 is a

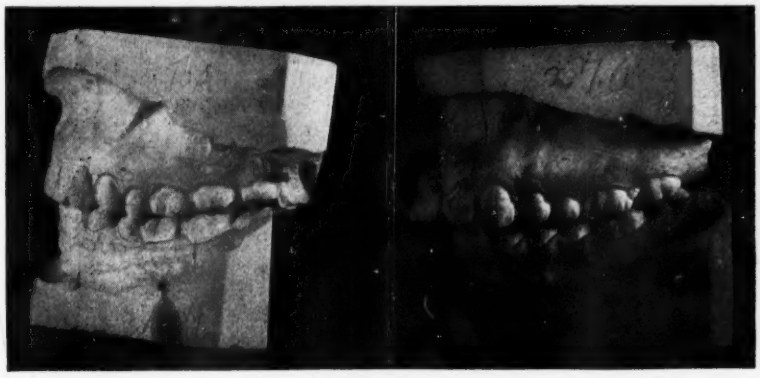

Fig. 32.

Fig. 33.

model with the arch bar in position. The tubes on the molar bands are aligned so that the arch bar will lie in a single plane. Sometimes this is impossible to do but it is better to have as little bend in the bar as possible.

The arch bar is made of 18-gauge wire. It is without threads or nuts. I will show later why a threaded bar is unnecessary. The hook for the intermaxillary rubber is just distal to the canine. The bar is not ligated to the teeth but the child is taught to take it off so the teeth can be cleaned. For intermaxillary rubbers, No. 6 Commercial bands are used. These were suggested to me by Dr. Crozat of New Orleans.

In Fig. 17-*B* is shown the maxillary lingual arch which is made of a 16-gauge body wire and 19-gauge arms. After the maxillary has been wid-

ened and the anterior teeth drawn back to their proper place, the two arms are joined together and the body wire is cut out as in Fig. 18-*A*. This is my maxillary lingual retaining arch. You can see why nuts are not needed on labial arch wire, for with the retaining wire resting against the anterior

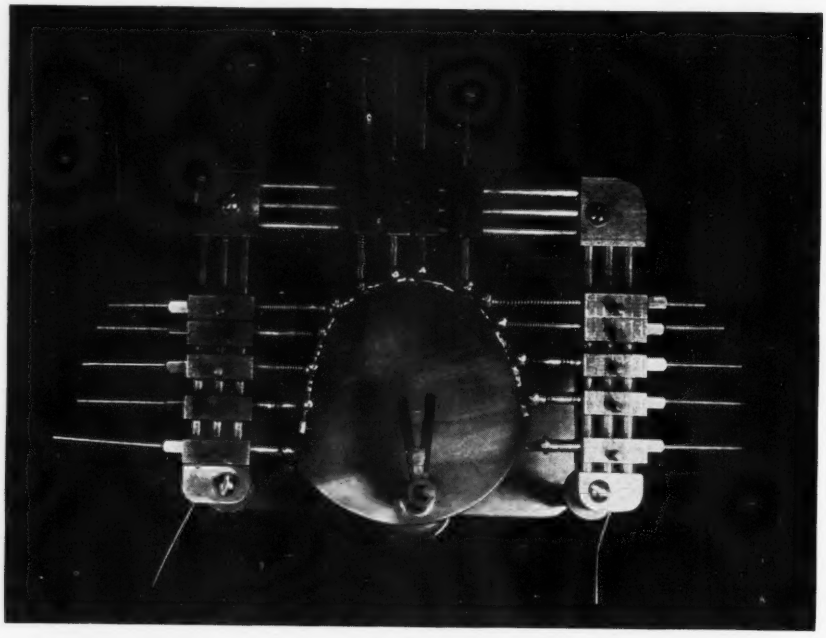

Fig. 34.

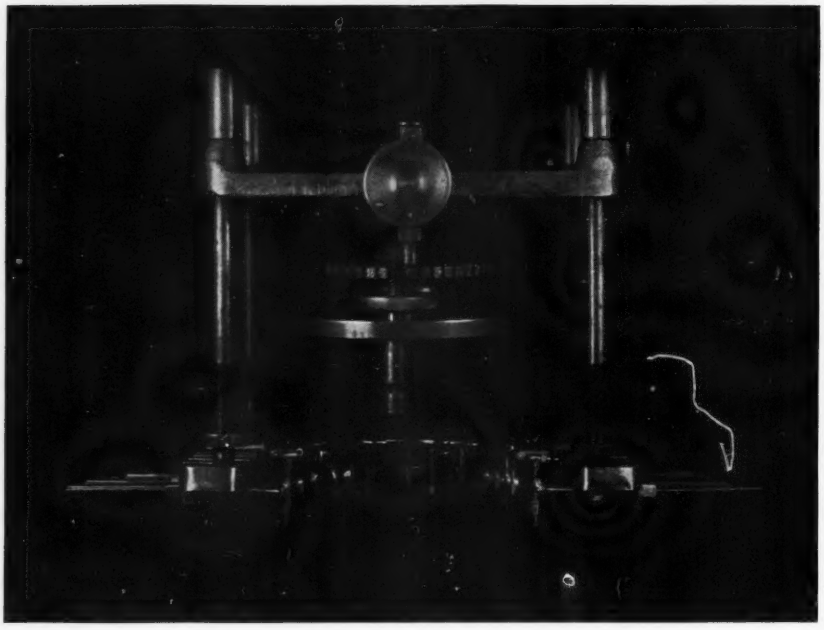

Fig. 35.

teeth, we have the whole upper arch as anchorage to move the mandibular molars forward.

Fig. 17 shows the lingual appliances on case when started. Fig. 18 shows retaining appliance in the same case.

After about eight months of retention, the patient is allowed to leave the labial arch off in the day time but wears it at night.

After four to six months, if the teeth have remained in normal occlusion,

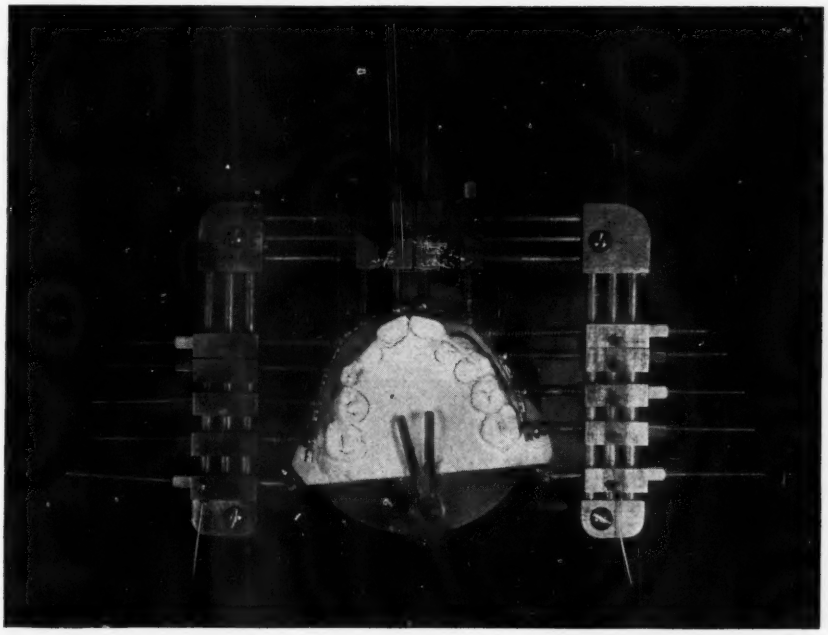

Fig. 36.

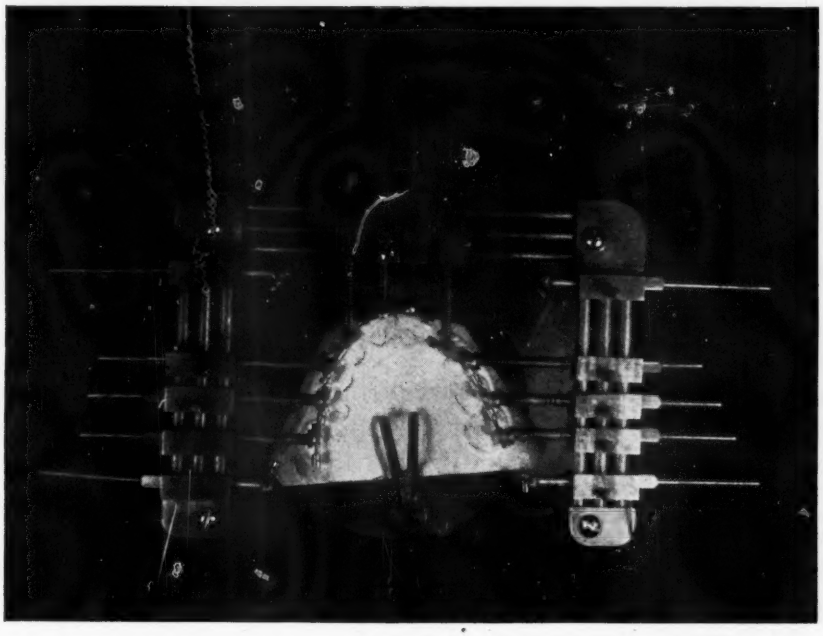

Fig. 37.

the patients are permitted to wear the bar two nights a week until gradually they discontinue it altogether.

The lingual appliances, both upper and lower, are worn at least a year after the teeth are in normal position; then the pins are removed from the

lock and the patient is instructed to wear them at night. Figs. 19 and 20 are the right and left views of Figs. 17 and 18.

Figs. 21 and 22 are right and left views of a unilateral distoclusion case before treatment and after left molar has been brought forward.

Figs. 23 and 24 are lingual views of this case. You will notice that the four mandibular incisors have drifted slightly to the lingual. This is easily corrected when lingual appliance is readjusted.

Fig. 25 is a front view. Please note the correction of the median line in this case, which was accomplished by shifting the mandibular anterior teeth to the right, as shown in Fig. 14-*B*. This is a picture of this case while being worked.

Figs. 26 and 27 show the right and left views of a case that has been under treatment about five months, intermaxillary rubbers having been worn about two months.

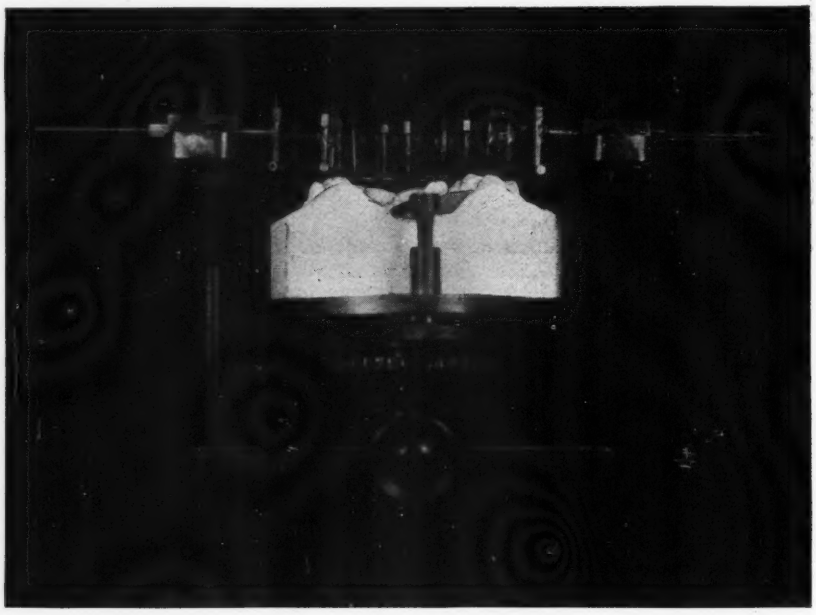

Fig. 38.

Figs. 28 and 29 are lingual views of the maxillary and mandibular models of this case. Fig. 28-*B* shows the upper lingual appliance in position. The arch has been widened sufficiently and the anterior teeth have been drawn back enough, so the arms of the appliance can be soldered together and the body wire can be cut out as in Fig. 18-*A*. The mandibular arch has also been widened enough and the four anterior teeth pushed forward into their normal position. (Fig. 29-*B*.) The deciduous molars are now ready to be brought forward by the method already described.

Figs. 30 and 31 are right and left views of another case. In this case I wish to call your attention to the supra-occlusion that has also been corrected.

Figs. 32 and 33 are the right and left views of another case.

I wish to warn you of the dangers of tipping your molars. This is usually due to exerting too much force, or applying the force too frequently. The appliance should never be spread more than $\frac{3}{64}$ of an inch and force

should not be applied oftener than once a month. If there is the slightest tipping of the molars, I put bands on the canines with lingual lugs to hold the anterior part of the appliance down.

Before closing I wish to show you some slides of an arch predeterminer I am using. Figs. 34 and 35 are side and top views of the machine, Figs. 36, 37 and 38 are views of the machine with model in position.

DISCUSSION

Dr. A. C. Gifford, Oshkosh, Wis.—Mr. President, Fellow Alumni, and Friends: To discuss a paper such as we have heard from Dr. Johnson is no easy matter, inasmuch as he has elaborated upon his particular plan of treatment and method of making his special appliances to do the things he has shown us here today, all of which have taken much time to perfect and master. It is very pleasing to me to see the mode of his procedure in moving the lower anteriors and premolars forward, for it seems Dr. Johnson and I have been working along the same lines without either of us knowing what the idea of the other was. For some time I have moved the anterior teeth forward in these cases just as the essayist has, but have not felt quite like it was a decided success; for there are several complications in this method, one I found was to keep the anterior teeth forward until I had the molars in contact. This I have not always succeeded in doing, even if they were put in normal occlusion.

I believe though that the method is faster if all the appliance is active and moving the four anteriors as swift as the premolars and canines. Otherwise there would be that bunching up of the anterior four to get out of the way of the teeth moving straight forward, namely, the canines and premolars.

It has been my desire to discontinue the intermaxillary elastics in these distoclusion cases when possible, as I find in my practice, as I suppose you all find, that the elastics or equalizing bands as Dr. Jackson calls them, are very easily removed, and if the case is for one of the high strung nervous individuals the progress is slow, inasmuch as the elastic bands are worn but little. It is the correct way I believe to place the teeth in alignment before the correction of the distoclusion is attempted. In the correction of the distoclusion I differ somewhat in the appliances on the maxillary arch. I see no need of an appliance that has a removable anterior bar, as a band placed on the canines and first molars connecting them on the lingual with 19-gauge wire over the anteriors with a small 23-gauge wire with hooks on distal ends, does the work very nicely and the anterior wire being small makes the cleansing easy.

Retention in these cases, unless the subject be of the development stage, is almost as difficult as the treatment to correct the case. I have given up trying to grow chins on people past the development stage, and unless the case is one where I know the results will be satisfactory, I change my method of procedure. I have found also that occasionally we must discontinue treatment on these cases for the process does not always bend, but is absorbed labially at the roots of the anterior teeth, and gingival margin of the gum breaks and we have a dipping down of the soft tissues that never regenerates.

Dr. Johnson spoke of breaking the tooth with the molar band off the model to solder the lock. Would it not be better to coat the inside of the band thinly with wax, and after the model was hard to warm the band and slip it off the tooth, thereby having a tooth to place your band back on, that would assure one of having it where it was originally, thereby facilitating the making of the remainder of the appliance.

I would like to ask Dr. Johnson why he anneals his appliance before placing it in the mouth?

Dr. Johnson (closing).—I have never seen the need of coating the inside of the band with wax, for when you break the banded tooth off, a line is left on the model, plainly showing where the band has been.

I should have used the term, temper, instead of anneal.

ORTHODONTIA*

By D. S. Sterrett, Erie, Pa.

ORTHODONTIA is a science which pertains to the treatment and correction of deformities of the jaws and irregularities of the teeth.

As to Its History and Development much has been written, but it must be summarized by the simple statement that individual attention to a small extent has been given to orthodontic needs as long as efforts have been made to practice dentistry. It was first brought to a scientific basis and offered as a postgraduate course of study in 1900 and since then has been studied and practiced by an ever-increasing number of men.

As to Its Present Status there are about 630 registered in the orthodontic directory, representing 25 countries. About half of these are practicing in the U. S. A.

As to Frequency of Occurrence it may be stated that approximately 75 per cent of the children of the present generation are afflicted with some sort of irregularity or malposition of teeth which interferes with their proper function.

As to the Causes of Malocclusion we consider five general groups in the order of their frequency of occurrence.

Mouth Breathing—account of nasal obstruction.
Malnutrition—either during the formation of the teeth or during the period of bone development. May result from faulty diet or diseases of childhood.
Dental Decay—especially of the deciduous teeth.
Habits—finger, lips, tongue or pacifier.
Loss of Teeth—unusually early or late, accidental or otherwise, also the very early or tardy eruption of teeth.

SYMPTOMS OF VARIOUS TYPES OF MALOCCLUSION

Mouth Breather.—Caused by nasal obstruction or habit, or both. The muscular pull of the mandible retards the proper development of the upper jaw; it remains narrower than it should be, increases in height and forward growth. The increase in height is the result of a lack of downward growth. The excessive forward growth interferes with the lip development, causing the upper lip to atrophy and the lower to hypertrophy.

Mouth breathing dries the mucous membrane lining of the mouth and throat, discourages salivary secretions, results in inflammation of the mucous membrane with frequent infection, bad odor and taste, thickening of the ear drums, frequent ear infection, greatly decreases the amount of air taken into the lungs, results in scanty supply of oxygen to the blood, with the blood

*A short talk given before the Rotary Club at Erie, Pa., with the idea of supplying orthodontic information to the public. Published as suggestions to other men who are called upon to present orthodontic information to the laity.

only partly purified, produces lack of red blood cells, anemia and a low resistance against the invasion of almost any kind of disease.

The typical appearance of a mouth breather is an underdeveloped lower jaw, and a narrow, protruding upper jaw. The arrangement of teeth in these jaws is such that half of the teeth do not touch their opponents and the other half do not fit very well.

Air and food are indispensable to growing children. Noses that breathe and mouths that chew are indispensable to the proper preparation of air and food.

Nasal passages obstructed by adenoids, and teeth malposed defeat the efforts of the body to function normally.

Malnutrition, Diet, Disease and Dental Decay.—These produce a different type of oral deformity which is briefly described as crowded teeth, or rotated teeth, one or more of the teeth meeting their opponents on the wrong side, which is about as effective as cutting with the back of the blades of shears—single teeth erupting inside or outside of the row. The constitutional effects are mild or severe during childhood depending on the comparative usefulness of the teeth or the resistance of the child, but eventually a physical breakdown is experienced.

These are the types of cases which furnish recruits for the large number of people who spend their spare time having their pyorrhea treated, and almost without exception, require much more dentistry to keep their mouths comfortable than persons with regular, proper functioning teeth.

Habits of sucking or biting thumb, lip or tongue, frequently produce deformity all out of proportion to the importance usually conceded these habits. The part of the upper jaw affected consists of two tender pieces of bone in the process of uniting with the rest of the jaw bone and is not strong enough to resist distortion by such a habit. These habits frequently help to develop habits tending to disturb the nervous balance of a child, and are considered important for that reason as well as because of the facial deformity they cause.

Deformities caused by early or late eruption of teeth, missing or supernumerary teeth, unwise extraction of teeth or accident generally start as a matter of minor importance, but if a single tooth is removed or out of alignment, and the consequent weakening of the line or arch of teeth causes a person to discontinue chewing on one side because it hurts, the consequences become serious in a short time. It means the loss of 14 teeth and three salivary glands to the food and to the other digestive organs, and the teeth themselves, with their surrounding gum tissue and supporting bone are more susceptible to disintegration on account of the lack of exercise.

The Treatment of Cases is usually begun between the ages of six and twelve at a time when bone is easily influenced and tooth roots are not fully developed. The best results are frequently secured by cases which receive attention as soon as symptoms of malocclusion are noticed. The youngest case I have seen under treatment was three years, the oldest, with the exception of treatment for war injuries, about twenty-five. The first mentioned was very difficult to begin, the other very hard to finish.

The Physiology of Treatment depends upon the principle that a steady gentle force transmitted to the bone will result in bone cells changing the structure which permits the roots of a tooth to move into the proper position. Obviously this is most easily accomplished during the time that natural growth is occurring in that bone and the jaws reach practically their adult size by the age of twelve years. From then on the possibilities of orthodontic aid become more and more limited.

The Mechanics of Treatment depends upon engineering principles with regard to anchorage and resistance, and the physical qualities of metals and other materials used.

The result of treatment of any particular case is problematical, depending upon the skill of the operator, and his ability to diagnose the cause of a malocclusion and restore that person's normal growing power, also depending upon the patient's attitude and cooperation. The number of visits or amount of appliance or type of appliance used is of little importance compared with other factors.

Results, however, must on the whole be quite satisfactory or those who undertake this work would soon find themselves without a practice. Also results in many cases are spectacular in the improvement produced in the health and appearance to a degree that goes far to repay the operator for the trials incident to the professional life of one who works continually with children.

NICKEL SILVER LINGUAL WIRE*

By Martin Dewey, D.D.S., M.D., New York City
Associate Professor of Orthodontia, College of Dental and Oral Surgery

IN the October, 1920, issue of *The International Journal of Orthodontia and Oral Surgery* is an article by Dr. Anema upon the use of the nickel silver lingual wire with the stretching pliers.

It has long been known that hard-drawn nickel silver possessed properties which rendered it suitable for wire-stretching, very similar to iridio-platinum. However, the difficulty was that when nickel silver was soldered with hard solder the temper was lost and it became too soft. Dr. Anema showed that nickel silver could be used for lingual wires if attached to the bands by means of soft solder.

Shortly after the publication of his article, a case appeared in the clinic which required the rotation of the first maxillary incisor as shown in Fig. 1. The case only required a slight expansion and the use of iridio-platinum was contraindicated because the patient could not afford to pay for such an expensive appliance.

In order to test the possibilities of a soldered lingual wire made from nickel silver as suggested by Dr. Anema, we constructed the appliance as shown in Fig. 1, used the principle of wire stretching to produce a slight expansion, the finger-spring to correct the torsiversion of the first incisor and also employed a silk ligature to rotate the tooth. The main portion of the lingual body wire was soldered to the molar bands with soft solder and as the case progressed this was the weakest part of the appliance.

During the process of treatment the lingual body wire was broken loose from the molar bands on both sides and had to be resoldered. This was because the soft solder does not possess sufficient strength unless used in large quantities, to stand the stress exerted on the lingual body wire from the wire-stretching pliers.

It must also be remembered that lingual body wires are subjected to a certain amount of stress from the force of mastication. Therefore the necessity of using a large amount of soft solder, which tends to make more of a bulky appliance than when iridio-platinum and hard solder is used.

The finger-spring which was used to press against the distolingual angle of the first incisor was also made of nickel silver of 21-gauge. This was likewise soldered to the body wire by soft solder. In order to assure the rigid attachment of the finger-spring, the end of the finger-spring had to be bent in the form of a loop or twisted around the body wire, so the soft solder only acts as a means of preventing it from slipping on the lingual body wire.

*A case report from the clinic of The Dewey School of Orthodontia, Postgraduate Department of the College of Dental and Oral Surgery.

If the end of the 21-gauge nickel silver finger-spring is not wrapped around the body wire, the soft solder will not be sufficiently strong to hold it in position. This finger-spring can also be attached by placing the end that is to be soldered to the body wire in its proper position, and then wrapping a fine brass wire ligature around the finger-spring and body wire, or taking a piece of thin narrow band material and wrapping it around the finger-spring and body wire, or by using a thin copper strip as a means of wrapping the two together as suggested by Dr. Jackson, and then soldering same with soft solder.

The thing to be remembered in this attachment of the nickel silver finger-spring to the nickel silver body wire, is, that some mechanical means besides the soft solder must be employed to insure the finger-spring's proper stability. In the region of the right second incisor, in Fig. 1, is seen a spur which is soldered to the lingual base wire for the purpose of controlling the direction in which the silk ligature pulls.

The silk ligature was looped around the incisor to produce rotation,

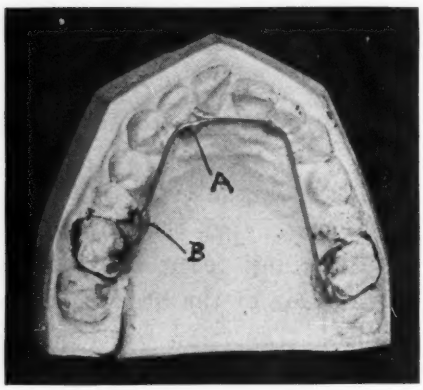

Fig. 1.—Appliance constructed from nickel silver and soft solder. Note finger-spring against first incisor. *A*, spur to control direction of pull of the silk ligature. *B*, spur around which ligature was tied.

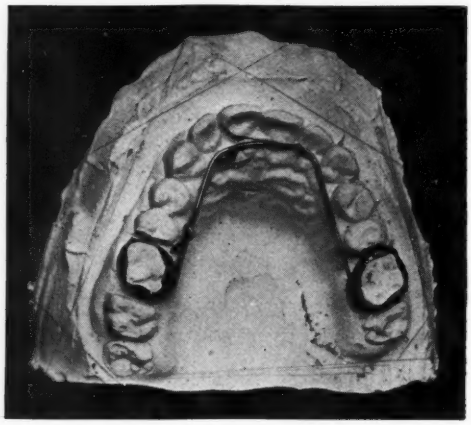

Fig. 2.—Cast made from modeling compound impression showing result of treatment.

and then brought back beneath the spur that is soldered to the lingual base-wire in the region of the second incisor. This spur holds the ligature near the dental arch and prevents it from occupying a position in the roof of the mouth. The end is tied around the spur which is soldered to the lingual base wire in the region of the second premolar. The reason for using a long wire ligature is that the greater the length of the silk ligature the greater will be the contraction.

The spurs which are soldered to the lingual base-wire must also be reinforced before they are attached, after some of the plans suggested for the reinforcements of the finger-springs.

In the first construction of the appliance, these spurs for the attachment of the silk ligature were not reinforced, and they also pulled off in the progress of treatment. It will be noticed in comparing the spur in the region of the second premolar as illustrated in Figs. 1 and 2 that the spur in Fig.

2 shows a greater bulk of solder which was made necessary by the fact that the end of the spur had been wrapped around the base wire and then the solder flowed over it.

Fig. 2 is made from a modelling compound impression of the case, at the time a retaining band was placed on the maxillary incisor. No attempt was made to correct any of the other teeth, or even correct the torsiversion of the first premolar because the premolar had been worn by mastication to fit in the malposition.

It is our belief that in clinic cases where a fee cannot be obtained sufficiently to cover the use of iridio-platinum, that very satisfactory results can be accomplished with the nickel silver alignment wire, used after the manner suggested by Dr. Anema which technic was practically the same as was employed in this case. However, owing to the fact that when iridio-platinum base-wires and bands, and hard solder is used a more delicate appliance can be constructed, these metals will have the preference in those cases that can afford to pay for the better appliances.

DEPARTMENT OF
ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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SALIVARY CALCULUS OF THE SUBMAXILLARY AND SUBLINGUAL GLANDS*

By Leo Winter, New York City

Clinical Professor of Oral Surgery and Diseases of the Mouth, New York College of Dentistry.

DUE to the fact that the textbooks on oral surgery practically ignore this disease it would appear that this condition was comparatively rare. However, a study of the literature shows that about 300 cases have been reported to date. Having seen four cases within the last year, the writer has felt that perhaps it is, in reality, not so rare, but that cases have not been recognized. One interesting feature of all the cases reported is the fact that not one of the cases, even those reported as recent as 1921, was radiographed to aid or confirm the diagnosis. Dr. Alexandre of Paris, reports a case, where the gland was removed for persistent swellings and upon section was found to contain a stone.

CALCULUS IN THE SUBLINGUAL GLANDS

Case 1.—A young lady, twenty years of age, was referred by her dentist for relief of an abscess in the floor of her mouth. Patient had a lower left abscessed lateral incisor extracted two weeks previously, and her symptoms subsided. Twelve days later, a swelling appeared in the floor of her mouth on the right side, which appeared to be increasing in size and giving her excruciating pains. Digital palpation revealed a hard mass. A longitudinal incision was made over this area and the stone practically popped out.

Case 2.—Student at the New York College of Dentistry complained of periodic swellings in floor of mouth. Under local anesthesia an incision was made and the stone felt beneath the knife and readily removed.

Case 3.—Mr. B., an editor, 34 years of age, complained of constant soreness in the floor of his mouth and occasional discharge of pus covering a period of three years. Examination of the floor of the mouth failed to dis-

*Read before the Harlem Dental Society, October 29, 1922.

close any appreciable swelling or hardness. Radiograms were taken for the purpose of eliminating the teeth as a causative factor, with the result shown in Fig. 1. Under novocaine anesthesia a transverse incision was made, and the stone removed without any difficulty.

Case 4.—The history of this case is unusually interesting for it shows that through lack of resorting to a radiographic diagnosis, the patient suffered for a period of seven years and underwent several operations for the clearing up of an obscure condition. The patient, a man of 32 years of age, a wholesale butcher by trade, noticed about seven years ago the beginning of a swelling under the jaw, accompanied with pain. He went to a physician, who examined the swelling and advised an operation. This the patient submitted to, and, aside from some postoperative pain, felt entirely relieved for about a year. The swelling reappeared, and he returned to his physician, who operated again, and advised him that something was removed; the exact nature of the substance the patient did not know. Subsequently two other operations were performed. The results, however, were negative and the patient was advised that he would probably have to resort to an

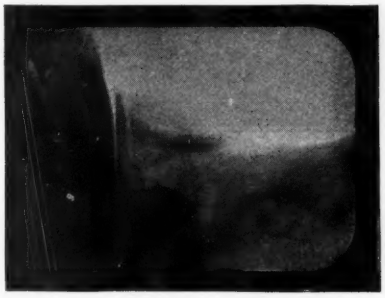

Fig. 1.

external operation for the removal of the gland, but before doing this it would be wise to eliminate the teeth. The patient was referred to the Oral Surgery Clinic of the New York College of Dentistry on July 10. Physical examination showed large swelling under the jaw and a profuse discharge of pus into the floor of the mouth, upon the slightest pressure externally. Radiograms were taken with the results as shown in Fig. 2. Under novocaine anesthesia the sinus was dilated and an attempt was made to remove the stones. The stones appeared to be quite deep, and the writer feared of pushing them in further, so the attempt was abandoned. The wound was irrigated with a weak iodine solution for 10 days at which time one stone came to the surface and was removed with a pair of thumb forceps. A week later pains and swelling appeared again and another radiogram was taken (Fig. 3). The area was anesthetized and the sinus distended, and the second stone removed by means of a Bogle curette. Fig. 4 shows the size of both stones. Aside from a slight postoperative edema for a few days the patient's symptoms have all disappeared, and he has made an uneventful recovery.

Remarks.—There appears to be nothing in the history of these cases to point to an etiologic factor.

Salivary calculi are composed of either organic or inorganic matter.

The inorganic consists of phosphate and carbonate of lime, potash and magnesium. The organic consists of bacteria and epithelial debris. More than

Fig. 2

Fig. 3.

half of the calculi are said to be found in the submaxillary glands, the balance being about equally divided between the sublingual and parotid.

According to various authors, calculi occur more frequently in males than in females.

The most common predisposing causes are: the entrance of foreign bodies into the ducts which act as nuclei; and microorganisms around which the salts are deposited.

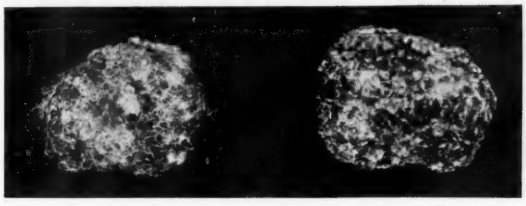

Fig. 4.

In all doubtful cases radiograms should be taken. Great care should be exercised in the taking of these radiograms, so that if calculi are present, they will be easily discerned, and the patient saved the possible annoyance of unnecessary operations, or the worry of a supposed malignant condition.

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Edited By
Clarence O. Simpson, M.D., D.D.S., and Howard R. Raper, D.D.S.

RESEARCH PROBLEMS IN ORAL RADIOGRAPHY*

By Clarence O. Simpson, M.D., D.D.S., St. Louis, Mo.

ORAL radiography has developed without special preparation or system, like Topsy "just growed." Individuals have progressed in various phases of the technic and manufacturers have improved the apparatus, but little scientific investigation has been given to perfecting this branch of radiography. It is impracticable for one dependent upon his practice for a livelihood to devote sufficient time to experimental work for the most expeditious and satisfactory results, however great the inclination.

It is proposed that this Society, as one of the objects of its organization, stimulate investigation by selecting a research committee, or submitting these problems to volunteers for a report at the next annual meeting. If at that time the report is incomplete, the work may be continued, but ultimately the solution of the problems directly related with our specialty will be recorded.

An illustrious example of this method of study is furnished by the National Society of Denture Prosthetists. Only a few years ago all dentists were supposedly proficient in artificial denture construction. It was a qualification assumed coincident with the receipt of a diploma. Some had a little more luck than others and a better reputation among the "china" wearers, but all dentists supplied "plates" without reservation or apology. When the members of the Prosthetic Society began to concentrate on the various steps of denture construction we learned that it was a most scientific and complicated procedure, and they have not yet agreed upon some points. However, they have corrected many of their former mistakes and revolutionized the standard of practice. It is a reasonable assumption that similar progress is attainable in radiodontia, and ten years hence we may view the present as a ridiculously undeveloped period of its development.

*Read before the American Society of Dental Radiographers at Los Angeles, Cal., July 19, 1922.

MILLIAMPERAGE

What is the most desirable milliamperage for intraoral radiography? This is an interesting question, and possibly one of real importance. The generally accepted technic is the use of 20 ma., but who can say it is correct? It is used and recommended because it gives reasonably satisfactory results, and is well within tube capacity. It may be correct, but since such arbitrary conclusions are usually erroneous, probably it is subject to advantageous modification. The milliamperage which will produce the best results under working conditions should be determined by careful experiments.

The length of exposure is related, but not in exact inverse ratio, to the milliamperes passing through the tube. If the objections do not exceed the advantages, it is desirable to reduce the exposure time to the minimum to avoid movement of the patient and vibration of the equipment. If you are using 20 ma. with an average exposure of 7 seconds, you may shorten your average exposure to 4 to 5 seconds by raising the amperage to 35 ma., which is not an excessive overload for a tube. Here another factor is injected—the size of the focal spot. Definition is improved by a finer focus of the cathode stream, but the size of the focal spot limits the quantity of current which may be used without fusing the target. Which will produce the best results at a long target-film distance, 10 ma. with a focal spot 1 mm. in diameter, 20 ma. with a focal spot 3 mm. in diameter, or 35 ma. with a 5 mm. focus?

TARGET-FILM DISTANCE

The relative advantages of different target-film distance is a debatable point, but why should not the correct distance for the tube in intraoral radiography be ascertained by scientific experiment? Most of us are working at a distance arbitrarily fixed by the capacity of the apparatus, the length of the cones used, or a preconceived idea. In the extremes are those who advocate a target-film distance of 3 or 4 feet, and the 8 inch distance which is the compensating factor for low voltage with the small type machines.

The theory advanced by McCormick that an extremely long distance eliminated the malar shadow by perspective is a fallacy, but on the other hand the distortion of an excessively short distance is glaringly apparent. The "inverse square" law of intensity requires the exposure to conform to an increased distance, and with a lengthened exposure other difficulties arise. Definition is improved and the objection to a large focal spot is reduced by increasing the distance, but other factors must be considered. In view of the relative length of exposure, what is the best target-film distance for intraoral radiography?

FILTERS FOR DENTAL RADIOGRAPHY

Most dental radiographic equipment is supplied with filters of aluminum or bakelite, which are featured as a safety factor in operation. Materials used as filters absorb the softer rays, and are necessary for protection of the skin in the prolonged exposures for deep therapy. The soft rays have a greater actinic action on photographic emulsion than hard rays, so when a

filter is employed in radiography it must be compensated for in the exposure. The short distance between the skin and the film in intraoral radiography leaves little difference in the skin dose and the photographic effect. The skin exposure must be sufficiently great to permit of the desired radiographic action on the emulsion.

Atmosphere acts as a filter for x-rays, and increasing the distance of the tube from the patient may be made to serve the same purpose as interposing filter material. With suitable voltage, are filters a protection to the patient, and do they improve or detract from the radiographic results?

SECONDARY RADIATION

One of the most serious handicaps in radiography is secondary or scattered radiation. If it were possible to eliminate secondary rays, negatives of startling brilliancy and definition could be produced. Flesh and bone are especially active in the production of secondary rays, and the detail and contrast of radiodontic records are probably impaired 25 per cent by this action. The weak rays coming from all directions impart a lower tone to the negative similar to light or chemical fog, and tend to carry the highlights into the shadows.

When striving for additional information from radiodontic examinations in the study of early pathologic changes, every distinction in structural density must be obtained. Doubtless you have seen the wonderful improvement resulting from use of the Bucky-Potter diaphragm in general radiography and fluoroscopy. This method is not applicable to intraoral examinations, but the example should stimulate search for a means to accomplish the end. Why not have this advance originating from this Society instead of a commercial source?

RADIOTHERAPY IN DENTISTRY

What are the benefits to be derived from x-ray therapy in dental practice, and what are the safeguards, technic and comparative results? The therapeutic value of x-rays has been demonstrated in the treatment of many conditions, and there are dental pathologic manifestations which respond indifferently to the methods of treatment in vogue. Medication, ionization and surgery are employed for treatment of periapical infections, perhaps x-radiation would prove more efficacious. It is possible that x-rays will inhibit dental caries, and the prevalence and ravages warrant a test. Some empirical cures of pyorrhea alveolaris by radiation have been reported, but the technic has not been perfected or the value of the treatment established. May not this Society have for a worthy object, the proof of whether or not x-ray therapy is useful in dentistry?

ECONOMICS

Although not a scientific problem, but appropriately after mechanics, science and service, the last point for your consideration is the economics of radiodontic practice.

The different scales of fees for radiodontic services, usually associated with varying character of service, suggest a careful survey of the elements involved. Other dental operations have been repeatedly analyzed by investigators in presenting economic principles to the profession, but radiodontia has followed false standards.

In the earlier days of radiography the fee for radiographing the teeth was fixed at $75.00 by a representative organization, while now it is advertised for $5.00. Assuming the service in each instance to be of equal inadequacy, there is a great discrepancy in the fees.

The essential requirements of a radiodontic examination can be stated with precision, the time and labor required for a thorough examination is fairly uniform, and the cost of production, overhead and supplies, does not appreciably vary in different localities. From this data a basis for compensation may be calculated. The present economic standards of radiodontia are chaotic, as those of general dentistry were before an analysis, and when this question is settled the commercial aspect can be subordinated.

The plan which favors the most satisfactory solution of these problems should be put in operation. Committee action is notoriously inefficient in depending upon the energy of the chairman, so this work may remain dormant if referred to a committee. The attendance of members at this meeting is not large enough to hope for the questions to be allotted to volunteers, but the records will be available when the Society is in a position to act in the matter.

DISCUSSION

Dr. De Los L. Hill.—Mr. Chairman, I don't want to let this paper go by without any discussion, as there is so much in it. I understand from Dr. Simpson's paper that he wishes us to discuss the factors, and overcome any problems that may arise, so that we may arrive at one thing—a definite technic. That at least has some bearing on the subject, hasn't it, Dr. Simpson?

Dr. Simpson.—Yes.

Dr. Hill.—If we ever expect to reduce radiography or roentgenology to the scientific basis to which it is really entitled, we must develop an absolute definite technic, so that results that are obtained today can be reproduced tomorrow. If we don't do that, we are falling short of our mark. Now, there are several points that enter into what might be called a definite technic that are minor matters to which Dr. Simpson referred, but which it is well to take cognizance of if you wish to obtain results. If you are making a denture (as has been referred to by Dr. McAlpin), if you make a denture today and over a period of two or three days you make a denture for that same mouth, you would naturally expect to get one the exact reproduction of the other. Unless we establish a definite way of taking all of our radiograms, you can take one picture today and attempt to duplicate it tomorrow, but when you analyze it, so to speak, there are differences that you yourself will discern, and if you don't other diagnosticians will point them out for you. There are several points that I would like to submit right along that line. One is the position of the patient, the focus of the tube, the distance which Dr. Simpson has touched on, your milliamperage which he has also touched on, the time of exposure; and two essential points, if you are going to get definite results are your development and the temperature of your developing solution. The best way to get definite information along those lines and see what differences—or at least I have found it so—can exist in the same patient at the same time, is to take radiograms made under different conditions as

far as milliamperage, time of exposure, temperature of development and time of development are concerned. If you gentlemen will make up a series of radiograms of any one patient, all made at the same time and same location with an exposure of one-half second and varying subsequent exposures one-half second up to five seconds, using the same distance, the same temperature of developing solution, the same time for development, and compare them, you will see the difference. If you make up another series, all the other factors being the same, but varying the temperature of your developing solution from 60 degrees up to 90 degrees, you will notice a vast difference. Now, do the same thing with the time development, all other factors being equal, and vary your time of development. If you wish to use five minutes as a basis of development, all good and well. Vary the development of those radiograms from one minute to five minutes and then on up to seven or eight minutes and see the difference. Then you are able to ascertain at what point you get the best results. Now I respectfully submit that while there may be a basis for doing work of this character that is generally recognized, or may be recognized by this body as being the best basis on which that work can be done, yet one man will get results under those conditions, while another will get better results under other conditions, due to factors that are not taken into consideration. The less we can vary our technic on taking radiograms, the better off we are. Why not have a definite technic, for instance, as to position, as to focus, and as to distance, as to milliamperage, as to the time of development, as to the temperature of development, and vary, first our time of exposure and then other factors if necessary. The point I especially wish to bring out is to get a definite technic in taking our radiograms, and vary, if possible, only one of those factors. Then if we do not get the desired results we will know where the trouble lies. Everything else being equal, it can only be in the one factor which we vary.

Dr. Simpson calls attention to an 8-inch distance, but said afterwards that he preferred to use an 18-inch distance—I think that is right, Doctor—correct me if I misquote you. I don't believe it is advisable, unless it is in the hands of an experienced technician to allow your tube or the target of your tube to come within 8 inches of your patient. As far as I know, we have no recognized authority who would give us that distance to work on. Probably, for the same reasons that Dr. Simpson brings out, for a number of years I have used the 18-inch distance as a basis. Now, we have to vary that because in certain positions, in taking intraoral radiograms we cannot get exactly 18 inches. Very frankly I don't measure my distance, and I doubt if Dr. Simpson measures his. We get accustomed to looking at the part to be radiographed and the tube, and we know approximately what it is, and when I say I use 18 inches I mean I use that as a basis. I may vary it two or three inches, but as a rule it will be less than 18 inches rather than more than 18 inches. I would like to ask the doctor what is his authority for making the statement that secondary radiation detracts 25 per cent from his radiograms. Why didn't he say 20 per cent, or 30 per cent? My experience has been that it is vastly different under different conditions, and I am asking that question for information.

On the economic side of the question I fear that we are liable to carry the economic side of radiography a little bit too far. There is not any question but than an x-ray machine is an economic product in your office—to use the plain, every day parlance, you make money with an x-ray machine, there is not any question in the world about that—but it depends on conditions under which the x-ray work is done, for whom it is done, the character of the patient—everything has to be taken into consideration. If one of my patients comes to take x-rays for a diagnostic purpose I charge him for that diagnosis absolutely separately from other operations. The x-ray work or the radiograms are only a means to the end of that diagnosis. While they may be the basis for the facts upon which I base my diagnosis, it is simply a means by which I can make it. I don't charge directly or place a fee for the radiograms that I take, but my fee is for my ability to render an intelligent diagnosis of the conditions that I find to exist in the patient's mouth. My x-ray machine is a part of my equipment just like my engine, and everything else that goes into the making up of a dental office, and I don't feel like it is placing our profession on the right basis, to make a definite charge for an x-ray. It is just like the drummer's

overcoat—it is on the bill but it doesn't show. It is part of the work, and I think that we are lowering the standard of our profession when we make a definite charge for an x-ray whether it is for our patient or a referred case. If it is a referred case, then it is not for the x-ray work, but it is for the diagnosis and the professional opinion that we offer on the condition of the oral cavity of that particular patient. If I may be allowed to just mention Dr. McAlpin's point which he brought out—I don't know whether it is primarily correct or not.

I will say, if you will allow it, that the students in our college in Atlanta, Dr. McAlpin, receive thirty-two hours of technical work on the subject of roentgenology that is entirely separate and distinct from their laboratory work, and their laboratory work varies. They must do a certain amount of laboratory work, but they must be able to turn out a certain class of radiographic work just as they turn out a certain class of prosthetic work, if you please, or just as they turn out a certain class of operative work and they must stay on that line of work until they are able to do it properly. That particular work is passed on by the chair of Roentgenology, just the same as the other subjects are passed on, and I just thought I would mention that for your information.

Dr. Lynn.—I would like to ask Dr. Simpson what his personal experience is with the sheet of metal that is used for absorbing the secondary rays.

Dr. Simpson.—The reason, Dr. Hill, that development was not considered as one of the problems was because it is a chemical process which has been thoroughly investigated by manufacturers. We can depend upon the findings of the research laboratory of the Eastman Kodak Company for our technic and conclusions in the photographic end of it. There is no question about its importance, but it no longer constituted a problem. I intended to state that probably 25 per cent of impairment was the result of secondary radiation, I certainly do not know how much, but by comparison to what general radiography has accomplished in using the Bucky-Potter diaphragm secondary radiation is a confusing element in our work. The economic problem presented was not for consideration as the determining factor in fees by any means. For example, a patient may be referred to you and you will make what would be termed in different language a general x-ray examination of the mouth and render an opinion and make the charge. Another patient may be sent to another operator, particularly a commercial laboratory, and they will give what they claim is the same service for a fee for which a professional man cannot afford to work. From this condition particularly the general practitioners of dentistry have had their fees for this radio-diagnostic work driven down and down. There is no competition between a mechanical operation and a professional service, but it has resulted in forcing down the fees for radio-diagnosis until it is difficult in many communities for a dentist or a radiodontist to get compensation for this service. The best way to combat it, is for this society to determine cost of production for a fee basis. You asked for a personal opinion on the filters, Dr. Lynn. If I had reached a conclusion I would have done it by experiments and would give you the results instead of the problem. I can tell you what I use and why, but it is not for you to accept. I use one-tenth of a millimeter of aluminum for a filter which is about the efficiency of a piece of cardboard, and do not consider it a safety factor in the least. It is used to filter out the scattered radiation arising from the glass of the tube. When the primary rays strike the tube they produce secondary radiation and I feel that this filter may reduce that. Apparently there is no difference in the results without the filter and with one millimeter of aluminum except the time of exposure is increased about 10 per cent. If it does nothing else than to increase our exposure it is objectionable, and that is the reason the question should be decided on a scientific basis instead of on a hunch basis. I have done most of my work without a filter and I have only recently added a filter as an experiment, working along the line that I have suggested here.

RADIODONTIC RIDDLES

Conducted by Clarence O. Simpson, M.D., D.D.S.

A Department Devoted to Discussion of the Scientific, Technical, and Ethical Problems of Radiodontia

Who's Who?

Q.—Can you recommend a good dentist in ——— for a family from my practice who is locating there? They are appreciative patients who can well afford to pay for proper service, and I want to refer them to the right man.

A.—Inquiries of this nature are so frequently received that they deserve attention and comment. Why should you ask advice about a competent dentist in a city like ———? Is there not a dental college there with a faculty composed of prominent men, whose names, affiliations, and previous conditions of servitude are spread upon the pages of Polk's antiquated directory? Does not that city have a chronic committeeman in the American Dental Association who by swapping invitations appears on every program of the Association? Are not all duly degreed and licensed dentists competent?

Oh! horrors! you must not forget your code of ethics. You reply that many of those faculty men do not practice what they expound, because you have seen the results of their operations. That there is more politics than science in the American Dental Association, and you have to attend state and local meetings to hear the men who are advancing dentistry. That you have met some good fellows from that city, but there is a distinction and difference between vocalists and instrumentalists. You state that the proportion of competent men in any profession is small, and dentists are born, not made.

Your statements are convincing, and, perhaps it would be difficult to disprove them. Without discussing the reason, it is true that superior dental operations are sufficiently rare to cause comment when seen. With due consideration and fairness, the chance of your patients' obtaining the character of service which you specify on the recommendation of a lay friend—or even a lady friend—is remote.

A lack of definite information about the relative skill of the dentists in the city mentioned prevents making the recommendation which you solicit, but here is a substitute suggestion which will satisfactorily serve in this and similar contingencies. Give your patients a letter of introduction to Dr. ———, a radiodontist, requesting him to refer them to the proper men for the attention required. This offers the best plan for placing patients in the care of honest, skillful dentists in other cities. A radiodontic practice is the clearing house, the observation post of dentistry in any city, and a radiodontist

deserving of the name is qualified to advise your patients and is actuated by altruistic motives in complying with your request.

Some dentists believe that radiodontists are hypercritical and prone to condemn operations, while to the contrary a radiodontist with extensive experience in general practice is charitable to a fault. He is familiar with the negligence, procrastination, and lack of cooperation of patients, he appreciates the exasperations and exacting technic of dental operations, and is ever ready to condone errors of commission, or to commend conscientious efforts. It is the lazy, dishonest, yea criminal operations, the suffering and disability of innocent victims which is the festering thorn in his flesh and the fermenting bacilli in his milk of professional loyalty.

In the line of duty the radiodontist is an avenging angel and an agent of justice in a community. He does not condemn operations or criticise operators, but merely portrays existing conditions and in so doing ultimately segregates the goats from the flock, hoists the transgressor by his own petard, and shoos chickens homeward to an uncongenial roost for a self-respecting fowl. The x-ray is the revealing power which has revolutionized dentistry; the radiodontist only the medium.

While you now find radiodontists only in the larger cities, there will be at least one in every small city when the x-ray is used for oral diagnosis as generally as indicated and the novelty of amateur radiography palls on the dentist. If a radiodontist is not available, refer your patients to a periodontist for advice about dental service. In the practice of tooth skinning and periodontal gardening, one must be continually harassed by the results of diagnostic negligence, operative blundering, and protected quackery. Imagine the diplomacy required, and the discouragement encountered by a periodontist with ideals.

The exodontists, splendid, courageous fellows though they are, may be too intent upon destruction to discriminate in constructionists. There are many essential destructive vocations, wreckers, soldiers, executioners—and exodontists; but if you were looking for a good physician you would not inquire of an undertaker.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

The Teeth of the Tuberculous. T. W. Power (New Haven). The Dental Cosmos, October, 1922, lxiv, 10.

This subject cannot be decided offhand by a few generalizations, but undoubtedly the teeth of the tuberculous show a tendency to certain peculiarities. The author has functioned as dentist to five tuberculosis sanatoria and his teachings are therefore based on extensive personal experience. In children there is a good deal of caries of the deciduous teeth, so that rows of roots may alone remain. There is also a notable tendency to defective enamel formation. This shows a primary metabolic disturbance. The relations of the disease in question to the state of the teeth are of course complicated. We do not know whether the caries is a cause or effect of the undernourishment and lowered resistance. Some of these children are not actually tuberculous, but are merely suspects. Hence it may be more satisfactory to study the adult tuberculous subject. Caries and pyorrhea are both highly prevalent and contrary to much teaching they frequently coexist in the same subject. The author has extracted over 1000 teeth annually for these two affections. In 50 per cent of caries the latter extends to the pulp with moist or dry necrosis. Some patients show as many as 20 of these teeth. Pyorrhea and gingivitis are extremely common with both salivary and serumal calculus, although the latter predominates greatly. This condition of the teeth may plausibly be attributed in part to the pulpy character of the food, which gives the teeth no exercise. Thus they get a little tender beef when perhaps they would thrive better in the long run on round steak, which requires much mastication.

The Ear, Nose and Throat Man and the Dentist. W. T. Patton (New Orleans). The Dental Cosmos, October, 1922, lxiv, 10.

The dentist can enlighten his ear, nose and throat colleague on four subjects, viz.: focal infection, headaches and neuralgias, antral disease and orthodontia. Patients are sometimes sent to the laryngo-rhinologist to ascertain whether there are foci of infection in the upper air and food passages; and while it is often possible to make a positive report it is never safe to make a negative one if the parts appear to be sound. Innocent looking tonsils

may harbor pus pockets and this is true also of the nasal sinuses. The dentist is considerably better off in regard to accuracy, for his x-ray plates give him positive and negative information alike. There is a dispute as to whether the antrum belongs primarily to the dentist or rhinologist, but the author believes naturally that primarily it belongs to the latter, while the dentists are concerned with it only incidentally, as when an infected root extends into the sinus. In about 30 per cent of antral disease the teeth are responsible, hence it is the custom of the rhinologist to invoke the aid of the dentist in the obvious dental case as well as in the obscure case in which no cause is apparent. The interest of the rhinologist in orthodontia arises from the common occurrence of deflected septum and high vaulted palate. If the child is young enough the dentist can prevent or overcome this state of affairs by orthodontic broadening of the dental arch. The same patient seen later may obtain relief only from an intranasal intervention.

The Effects of the X-Rays and Radium on the Blood and General Health of Radiologists. G. F. Pfahler (Philadelphia). American Journal of Roentgenography, October, 1922, ix, 10.

The report of five deaths from exposure to radiation of one or the other type from aplastic anemia is of deep personal interest to every radiologist, even though there is some doubt of the responsibility of the rays in some or all of such cases. It is significant that some insurance companies decline to insure radiologists as extra-hazardous risks, although the warrant for so doing is founded on early cases in which protection was not understood or properly applied. Considering the vast amount of life saved through the radiologist, the insurance people can well afford to exempt the latter. Next to aplastic anemia the danger to operator is found in a certain liability to develop malignant disease, but the danger of this should have passed with modern protection. There have been three deaths in the London Radium Institute since its foundation in 1916, but of this number only one could be said to have occurred from a possible occupation disease—anemia (pernicious). The other patients died of infectious endocarditis and pneumonia respectively, under circumstances which made it credible that their resistance had been lowered through constant exposure to the rays. Of late it has been assumed that the radium worker is the only one endangered at the present day, but recently Larkin reported a death from anemia in a veteran radiographer, who continued to work long after his blood was badly affected. This case was duplicated in Dr. Treboschi, an Italian. The five cases mentioned at the beginning of the article comprise the three in the Radium Institute—for all three patients were notably anemic—the case reported by Larkin, and that of the Italian, both the latter victims, as already stated, having been exposed for many years to the x-rays.

Many blood studies have been made on workers, especially by Mottram of the London Radium Institute, the latter in both radium workers and radiographers, also in normal controls. The best control, however, was the use of protective measures in association with the daily blood counts which made

it possible to carry protection to a fine point and also to spare the worker unnecessary handicaps. In addition, considerable work has been done on animals. Since November, 1921, at the author's instigation members of the Philadelphia Roentgen Society have been making blood examinations on themselves and their fellows, and in addition an attempt was made to control the blood of all the radiologists in America through circular appeal. One thousand blanks brought 338 replies, showing a certain amount of apathy. It was ascertained incidentally that the general health of radiologists was above average and it may or may not be significant that in the year of the influenza pandemic the entire staff of one of the radium producing companies were immune. Undue exposure to either rays or radium is known to induce leucopenia at times, with other anomalies of the blood count, while low blood pressure—uncomplicated—is quite common. Asthenia may be due when present to long and arduous work, which is necessary to offset the heavy overhead charges of operation. Cutaneous lesions are entirely avoidable; complete protection is feasible and necessary to those who work with gamma rays. A dental film carried in the pocket will give a measure of excessive exposure, for it should not fog or blacken under ordinary exposure. Shorter hours and outdoor recreation are recommended.

Etiology of Alveolar Pyorrhea. J. Bodo (Blumenfeld). Vierteljahresschrift fur Zahnheilkunde, 1922, xxxviii, i.

The author reviews the entire subject, quoting mostly continental writers. The calculus theory may be disregarded, as calculus without pyorrhea is common. The infection theory is largely dependent on the supposed cooperation of callus with infection of various types, but there may be a high degree of pyorrhea without any evidence of inflammation. Again there may be intense suppurative gingivitis with escape of pus from beneath the gum, yet it may end in complete resolution. The spirochete theory, which originated during the war, was of short duration and is no longer mentioned. The theory of Gottlieb merits attention. His studies convinced him that pyorrhea has its début in a primary atrophy of the alveolus. Physiologic atrophy is normally made good by a new formation of bone and when the latter fails to appear the atrophy virtually becomes pathologic. However, right or wrong, we do not know the causal factors of this failure of osesous new formation. The writer, however, disputes this mechanism. He has since 1909 held publicly that the lateral lever-like pressure upon the teeth is the cause of the affection. Moreover there may be pyorrhea without any atrophy at all. Weski has recently claimed that Gottlieb's physiologic atrophy is a myth. The author will cover his theory of lateral pressure in a special forthcoming article.

Alveolar Necrosis from Mercurial Intoxication. O. Schneider (Munich). Zahnaerztliche Rundschau, October 17, 1922, xxxi, 41.

In 1917 the author had charge of a severe case of unilateral necrosis of the mandible, the mercury having been taken internally. Cases of this sort

are not so rare when the drug has been injected, but the present example is of a much more infrequent type. The patient was a servant girl, aged 21, who had attempted suicide by swallowing a solution of sublimate. Her stomach was at once washed out and she was taken to the hospital for treatment. For several weeks she presented active symptoms of poisoning, including evidences of nephritis, but gradually improved in all directions, with the exception of a gingivitis which was of late appearance—two weeks after swallowing the poison. Under proper management this slowly improved, but the teeth were found to be loose in the left mandible. Eight weeks after the suicidal effort she first came under the care of the dentist who found the teeth mostly well articulated, and no gingivitis, but the left lower alveolar process was completely denuded of mucosa from canine to wisdom tooth. A certain amount of pus could be squeezed out. The process showed an abnormal mobility and the teeth in this segment were also loose in their sockets. The x-ray showed a line of separation between the alveolar process and the rest of the mandible. This slough was readily lifted from the mouth with forceps. No more pus formed and the wound closed smoothly. The preference for the left side was due probably to the presence of some roots of teeth in the affected segment.

Causal Relationship Between Dental and Cutaneous Affections. Bodlaender. Zahntechnische Reform, October 22, 1922, xxvi, 42.

The author first mentions the fact that the powdering of ordinary pointed warts sometimes induces the formation of bullae in the skin and mouth. Affections of the teeth sometimes play a rôle in the development of alopecia areata, while conversely the extraction of teeth has sometimes cured the same affection. There is a similar causal association between affected teeth and herpes zoster, nor is the latter to be set down to the arsenic used for the destruction of the nerve. Paradoxical cases of toothache have sometimes terminated in the appearance of groups of zoster vesicles on the gums. In certain cases filling the teeth has been followed by outbreaks of vesicles in the skin, but the connection is not easy to establish. The chemicals used may be accused if these are not commonly employed, and when arsenic has been needed there is often the suspicion of a special sensitiveness to this metal. In rare cases the causal relationship has been demonstrated beyond doubt. In other rare cases sharp fragments of teeth have been responsible for eczema about the lips which have also been compressed between the upper and lower teeth. The use of various drugs for mouth-washing may contribute to the development of these eczemas about the lips. The author discusses in this connection the diseases syphilis, tuberculosis and actinomycosis, but is quite silent as to the possibility of septic roots, etc., causing pyogenic dermatoses by focal infection.

The International Journal of Orthodontia, Oral Surgery and Radiography

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 801-809 Metropolitan Bldg., St. Louis, Mo.

Foreign Depots—*Great Britain*—Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

Subscription Rates.—Single copies, 75 cents. To anywhere in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $6.00 per year in advance. Under foreign postage, $6.40. Volume begins with January and ends with December of each year.

Remittances—Remittances for subscriptions should be made by check, draft, postoffice or express money order, or registered letter payable to the publishers, The C. V. Mosby Company.

Contributions—The editor will be pleased to consider the publication of original communications of merit on orthodontic and allied subjects, which must be contributed solely to this journal.

Opinions—Neither the editor nor the publisher hold themselves responsible for the opinions of contributors, nor are they responsible for other than editorial statements.

Reprints—Since it is not desirable to hold type standing longer than absolutely necessary, all requests for reprints should be made at time of submitting manuscript for publication. Rate card will be sent with galley proof.

Communications—Contributed articles, illustrations, letters, books for review, and all other matter pertaining to the editorial department should be addressed to the Editor, Doctor Martin Dewey, 501 Fifth Ave., New York City. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 801-809 Metropolitan Building, St. Louis, Mo.

Illustrations—Such halftones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

Advertisements—Objectionable advertisements will not be accepted for publication in this journal. Forms close first of month preceding date of issue. Advertising rates and sizes on application.

Change of Address—The publishers should be advised of change of subscriber's address about fifteen days before date of issue with both new and old addresses given.

Nonreceipt of Copies—Complaints for nonreceipt of copies or requests for extra numbers must be received on or before the fifteenth of the month of publication; otherwise the supply is apt to be exhausted.

Entered at the Post Office at St. Louis, Mo., as Second-Class Matter.

EDITORIALS

The Taggart Case

AGAIN we think it our duty to call the attention of our readers to some of the conditions which have arisen in the dental profession as a result of the activities of one William G. Taggart in securing patents on certain processes and bringing suit against dentists for the infringement of these patents.

So far as we know, three different suits have been filed by Taggart in the past, to substantiate the aforementioned process patents. The first suit, filed in Washington, was won by Taggart and reversed in the higher court. The second suit filed by Taggart was against a dentist in Chicago. This was also won by Taggart. After the winning of the first suit in Chicago, Taggart brought into count a large number of men in Chicago, which suits caused the formation of the Dentists' Mutual Protective Alliance, for the purpose of defending the dentists sued under the Taggart patents. As the result of

this legal contest, the Dentists' Mutual Protective Alliance spent over forty-one thousand ($41,000) dollars for the purpose of proving the Taggart patents invalid, and thereby saved the dental profession several millions of dollars during the last few years. The case was decided against Taggart in the District Court of the United States for the Northern District of Illinois, Eastern Division. Taggart carried the case to the United States Circuit Court of Appeals where it lay for some time.

However, in spite of all the legal obstacles which Taggart's attorneys could use to prevent the case from coming up for final review, it was decided in September. Taggart lost on every count with the exception that his patent on his casting machine was held valid. The United States Circuit Court clearly brought out, as did the lower court decision, that the real inventor of the inlay was Dr. B. F. Philbrook, a dentist living, at the time he invented the inlay, in Dennison, Iowa. We believe Dr. Philbrook is at the present time practicing in Sioux City, Iowa.

There is one phase of the Taggart case that impresses itself very clearly upon our memory; that is, the wining and dining of Taggart, at the time he presented his claim of having invented the inlay, to the dental profession. Several men immediately came forth as active press agents and claimed he (Taggart) was the savior of the dental profession; but in a short time, it was proved that instead of Taggart's giving the dental profession anything, he was a smooth salesman using the dental profession as an advertising medium for the selling of his products and processes, upon which he had obtained a patent. At the time he brought the first suit in Washington, it was proved that several men had made cast inlays prior to Taggart's application for patents. Evidence also seems to indicate that Taggart was present at one of the meetings where a clinic was given on the cast inlay. Some of the strongest evidence presented in the case at Washington was furnished by Dr. O. H. Simpson of Dodge City, Kansas. At the time Taggart was suing certain members of the Dentists' Mutual Protective Alliance, the alliance found that Dr. Philbrook had preceded Taggart by ten years, and has put and maintained in public use, the same methods of making cast dental inlays. In regard to Philbrook's work, the United States Circuit Court of Appeals has the following to say:

"He prepared the tooth cavity; he caused the walls of the tooth cavity to determine the size and shape of the pattern composed of plastic materials, namely, dental wax; he formed a mold about the wax pattern; he formed a crucible-shaped depression in the mold, he formed a sprue-hole connecting the crucible and the interior of the mold from which he melted out the wax pattern; he melted the inlay metal in the crucible; and by air pressure he forced the molten metal into the hollow." It was this particular finding of the Court that resulted in all of Taggart's claims being decided against him.

One cannot help but notice the difference between the two men, Taggart and Philbrook. Philbrook was over ten years ahead of his time, doing something for the welfare of the dental profession which they did not accept at the time he presented it. However, he was content to let the value of his

work be decided by the future. He gave freely to the profession of what he had and asked no return whatsoever. Taggart gave nothing and asked for unjust glory and much money. During the past few years the dental profession has honored different men who have contributed to the advancement of dentistry. As we look back over the history of dentistry and review what various men have contributed, we find none have given more to the profession than Dr. Philbrook. The method which he advocated many years ago has now become standard practice. The profession is indebted to him for having carefully preserved records of his work in such a manner as to prove to the Court that Taggart's claims were unjust and thereby Dr. Philbrook has saved the profession millions of dollars which Taggart would have collected as tribute. We believe it is only fair that the American Dental Association take some proper recognition of the work which Dr. Philbrook has done and contributed to the dental profession.

The Systematic Development of X-Ray Plates and Films*

DURING the past few years many books have appeared on the subject of radiography, but probably no work has been so greatly needed as something on the proper development of plates and films. The average man who goes into radiography purchases an outfit suggested to him by some salesman, constructs some kind of a dark room and proceeds to "interpret" radiograms. Consequently, 50 per cent of the important steps in interpreting a radiogram has been overlooked by the fact that the operator does not become familiar with the development of the films from a scientific standpoint.

Many of the unsatisfactory results obtained in radiography can be traced to the improper handling of the films after the exposure. The x-ray outfit and the film have been prepared by the manufacturers and consequently unless seriously tampered with, will give standard results.

After the exposure of the film, it then lies with the operator as to what the result will be. It is the belief of many men that all that is necessary to make a good radiogram is to have a satisfactory radiographic equipment, when, as a matter of fact, more films and plates are probably spoiled in the dark room than anywhere else. The developing of an x-ray plate is a chemical reaction and one of the most sensitive reactions that is known. Not only is the x-ray plate sensitive to lights and chemicals, but temperature also greatly changes results. Added to these three important factors is a fourth condition which is almost universally disregarded, and that is cleanliness. All of these things are carefully described in Dr. Wendell's work on the x-ray plate. Any man who has made radiograms should read the book from beginning to the end, and if he has delegated the developing of radiograms to his assistant he should purchase the book for her. The small amount required to purchase the book will yield many fold in more satisfactory results.

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*Systematic Development of X-Ray Plates and Films. By Lehman Wendell, B.S., D.D.S., Chief of Photographic Work, Instructor of Prosthetic and Orthodontia, College of Denistry, University of Minnesota. Price $2.00. C. V. Mosby Company, St. Louis.

ORTHODONTIC NEWS AND NOTES

Third Annual Session of Southwestern Society of Orthodontists

The Third Annual Session of the Southwestern Society of Orthodontists will be held at the Gunter Hotel, San Antonio, Texas, January 17, 18, 19, and 20, 1923. A cordial invitation is extended to all ethical practitioners interested in orthodontia. The San Antonio Dental Society will hold its mid-winter meeting in conjunction with the Orthodontists on the day of the 20.

The following program will be carried out:

WEDNESDAY, JANUARY 17, 1923

10:00 A. M.—Address of Welcome, Dr. S. B. Riggs, San Antonio, Texas.
Response, Dr. T. Walter Sorrels, Oklahoma City, Okla.
President's Address, Dr. W. E. Flesher, Oklahoma City, Okla.

11:00 A. M.—Outline of Proposed Course, Dr. Oren A. Oliver, Nashville, Tenn.

12:00 NOON—Lunch, private room, Gunter Hotel.

1:30 to 3:00 P. M.—Orthodontics, Dr. Oren A. Oliver.

3:00 P. M.—Golf Tournament, 18 Holes Handicap Play, Four Prizes. (All guests eligible.)

THURSDAY, JANUARY 18

9:00 A. M.—Orthodontic Appliances, Dr. Oren A. Oliver.

12:00 NOON—Lunch, private room, Gunter Hotel.

1:30 to 4:30 P. M.—Table Clinics:

(1) A Simple and Accurate Method of Constructing Lingual Appliances by Dr. Edmund Arnold, Houston, Texas.

(2) A Practical Form of Bracket Attachment to Labial Arches, by Dr. O. E. Busby, Dallas, Texas.

(3) A Simple Method of Replacing Missing Anterior Teeth During the Period of Treatment and Retention by Dr. P. G. Spencer, Waco, Texas.

(4) Reducing and Splinting Fractures by Means of the Bracket Band and Ribbon Arch, by Dr. T. O. Gorman, San Antonio.

(5) Dr. T. Wallace Sorrels, Oklahoma City, Okla. (Clinic to Be Announced.)

(6) An Appliance for Expansion Where Extreme Overbite Prevents Use of Lingual Appliances, by Dr. Wm. T. Chapman, El Paso, Texas.

(7) Treatment of a Bilateral Distoclusion Case, Using Soldered Lingual and High Labial Appliances, Dr. W. E. Flesher, Oklahoma City, Okla.

(8) Appliances for Treating Very Young Patients, Dr. A. B. Conley, Dallas, Texas.

(9) Maxilla Development from Orthopedic Stimulation, Dr. T. M. Robertson, Coffeyville, Kansas.

(10) Aderer Clutch Lock Used with Angle Ribbon Arch, by Dr. E. E. Moore, Fort Worth, Texas.

(11) By Dr. Wm. B. Stevenson, Amarillo. (Clinic to be announced.)

FRIDAY, JANUARY 19

9:00 A. M.—Orthodontic Treatment, Dr. Oren A. Oliver.

12:00 NOON.—Lunch, private room, Gunter Hotel.

1:00 to 2:30 P. M.—Orthodontic Technic, Dr. Oren A. Oliver.

2:30 P. M.—Paper, Some Phases of Distoclusion, by Dr. T. G. Duckworth, San Antonio, Texas.
Paper, Service and Compensation, by Dr. Hugh G. Tanzey, Kansas City, Mo.

4:00 P. M.—Summary of Technic, Clinics and Papers, by Dr. Oren A. Oliver.
Presenting of Models, Radiograms of our Troublesome Cases, etc., for general discussion.

SATURDAY, JANUARY 20

9:00 to 10:00 A. M.—Business session, election of new members, election of officers, discussion of President's Address, selection of place of 1924 meeting.

10:00 A. M. to 12 NOON—Tour of city, visiting all of the points of historic interest in and about San Antonio.

12:00 NOON—Lunch, private room, Gunter Hotel.

2:00 P. M.—Mid-winter Meeting of the San Antonio Dental Society.

7:00 P. M.—Banquet, Gunter Hotel.

Items of Interest

Dr. Zenas T. Roberts announces the removal of his dental offices from Rocky Ford, Colorado, to 624-625 Majestic Building, Denver.

Dr. Geo. F. Seeman announces the removal of his office to 447-449 Lambuth Building, Nashville, Tenn.

Dr. Hubert T. Gosney announces the opening of his office, Suite 220 Franklin Bldg., 301 East Franklin St., Richmond, Va. Practice limited to orthodontia.

Dr. Otto J. Monson, orthodontist, announces the removal of his office to 321 Junipher Bldg., Third Street and Santa Monica Blvd., Santa Monica, Calif.

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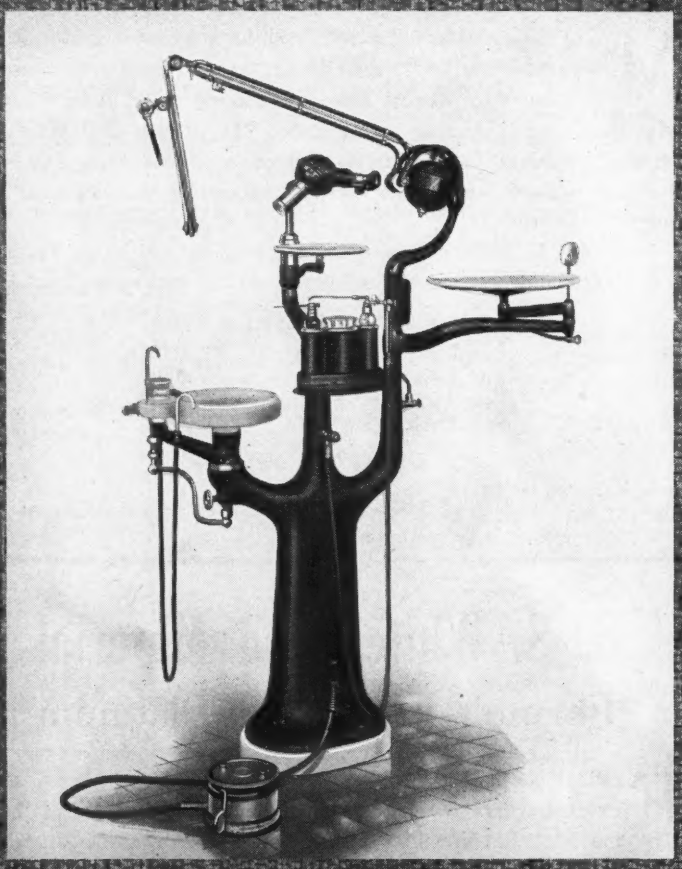

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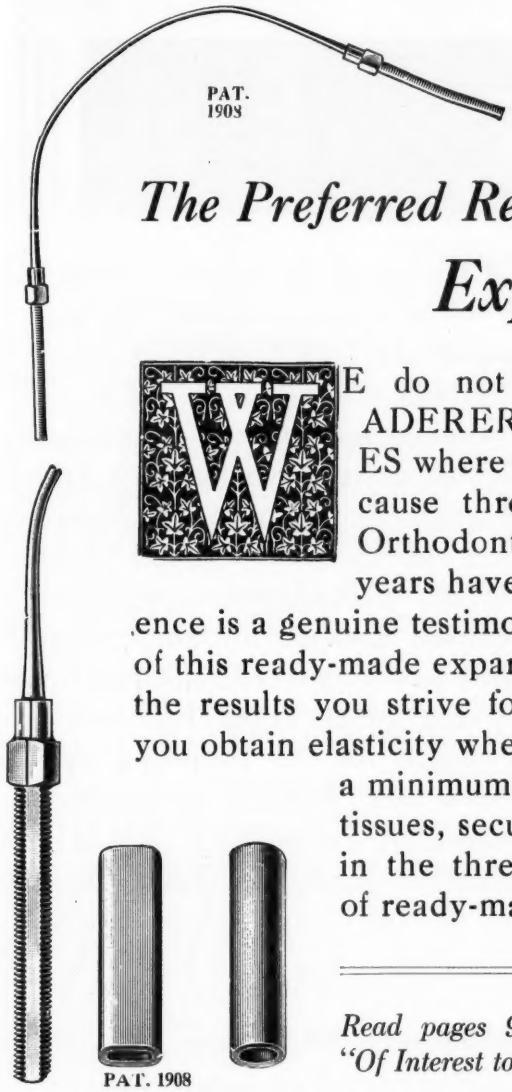

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IT pays to know the satisfaction that comes with the use of JULIUS ADERER'S NO. 4 WIRE. Every necessary factor — quality, elasticity, workability and durability — assured. For over fifteen years JULIUS ADERER'S PLATINUM NO. 4 WIRE for orthodontic appliances has never caused disappointment, never failed to fulfill exacting expectations. A trial order — the most rigid test — and history will repeat for the thousand and one time — another decided preference created for the old, dependable JULIUS ADERER NO. 4 PLATINUM GOLD WIRE.

"Julius Aderer's Products are Inseparably Linked with Satisfactory Results"

We wish you a real Merry Christmas and as Prosperous a 1923 as you could wish for yourself.

Julius Aderer, Inc.
MANUFACTURERS
MAIN OFFICE
47 West 42nd Street
New York, N. Y., U. S. A.

Julius Aderer's Clutch Lock (Improved) Is *Demonstrating Its Usefulness*

Illustration Shows the Actual Size.

ALL those in need of an efficient yet inexpensive lock for labial or lingual appliances will be enthusiastic over the effectiveness of our deservedly popular Clutch Lock; designed to fulfill these principal functions: holding the arch wire firmly; making locking or unlocking a simple operation; preventing wearer from accidently or purposely removing the appliance and the many other proven advantages afforded by your use of our Clutch Lock are set forth in Circular-OS which contains some really interesting information. May we send you a copy?

JULIUS ADERER, Inc., Manufacturers
Main Office, 47 W. 42 ST., NEW YORK, N. Y.

THE JULIUS ADERER
ORTHOANEALER
PATENTED

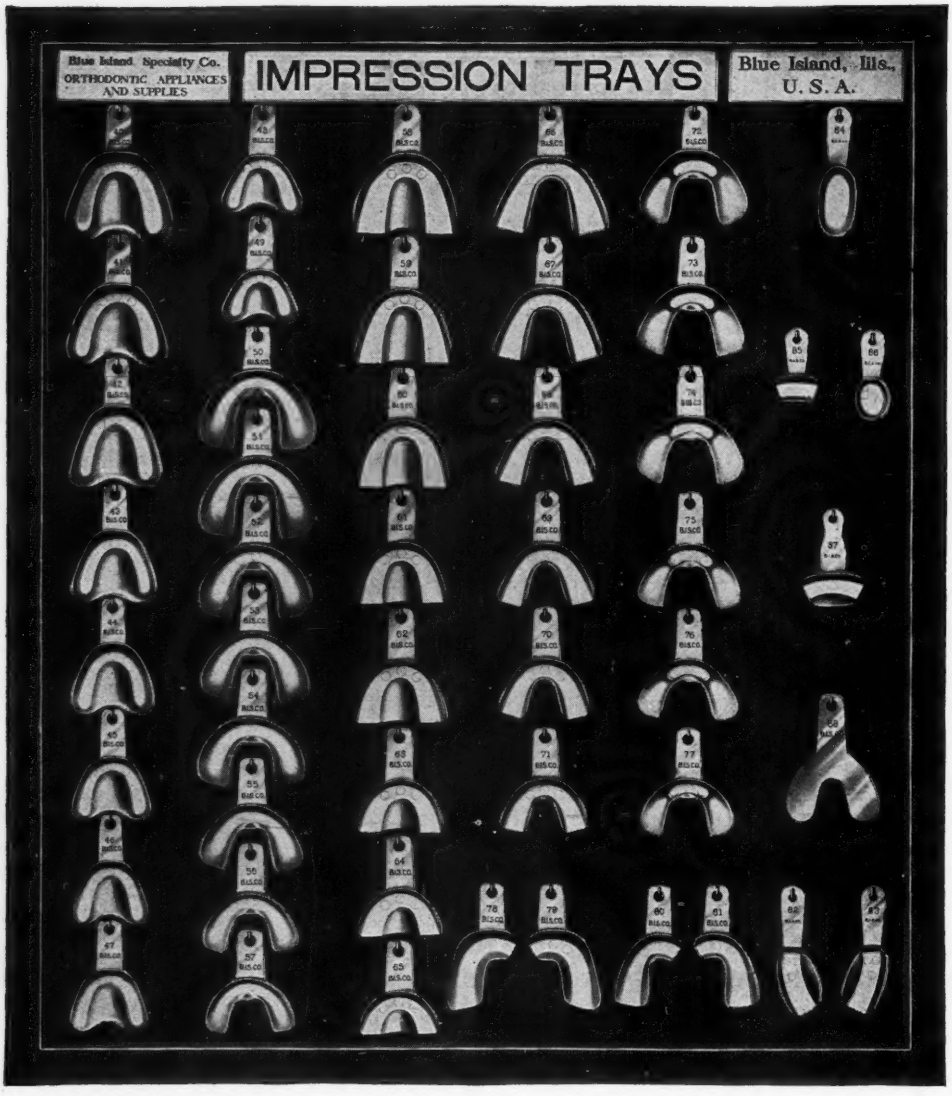
Illustration One-Half Actual Size

SUPPLIES a successful and inexpensive means of evenly, thoroughly and quickly heating, tempering and hardening platinum-gold wire or finished orthodontic appliances. The use of the ORTHOANEALER prevents flame of the Bunsen burner from melting the wire or appliance, at the same time allows sufficient heat to reach the article so that a few seconds exposure over the Bunsen burner will perfectly anneal arch wire, finger springs, etc. Once used, the operator will never again inconvenience himself by being without Julius Aderer's ORTHOANEALER which with one monel metal disc is priced at . . ***$3.00.*** Extra discs — 40c each; $4.00 per dozen.

JULIUS ADERER, INC. **Manufacturer**
Main Office, 47 W. 42 St., New York, N. Y.

IMPRESSION TRAYS

For the General Practitioner



Impression Trays, Pressed Aluminum, Gauge 18, Handle Gauge 14

Trays number from 40 to 88. Complete set put up in handsome box: Mahogany, Oak, Ebony and White Enamel; also sold separate.
Special trays made to order. Impression tray catalogue sent on request.

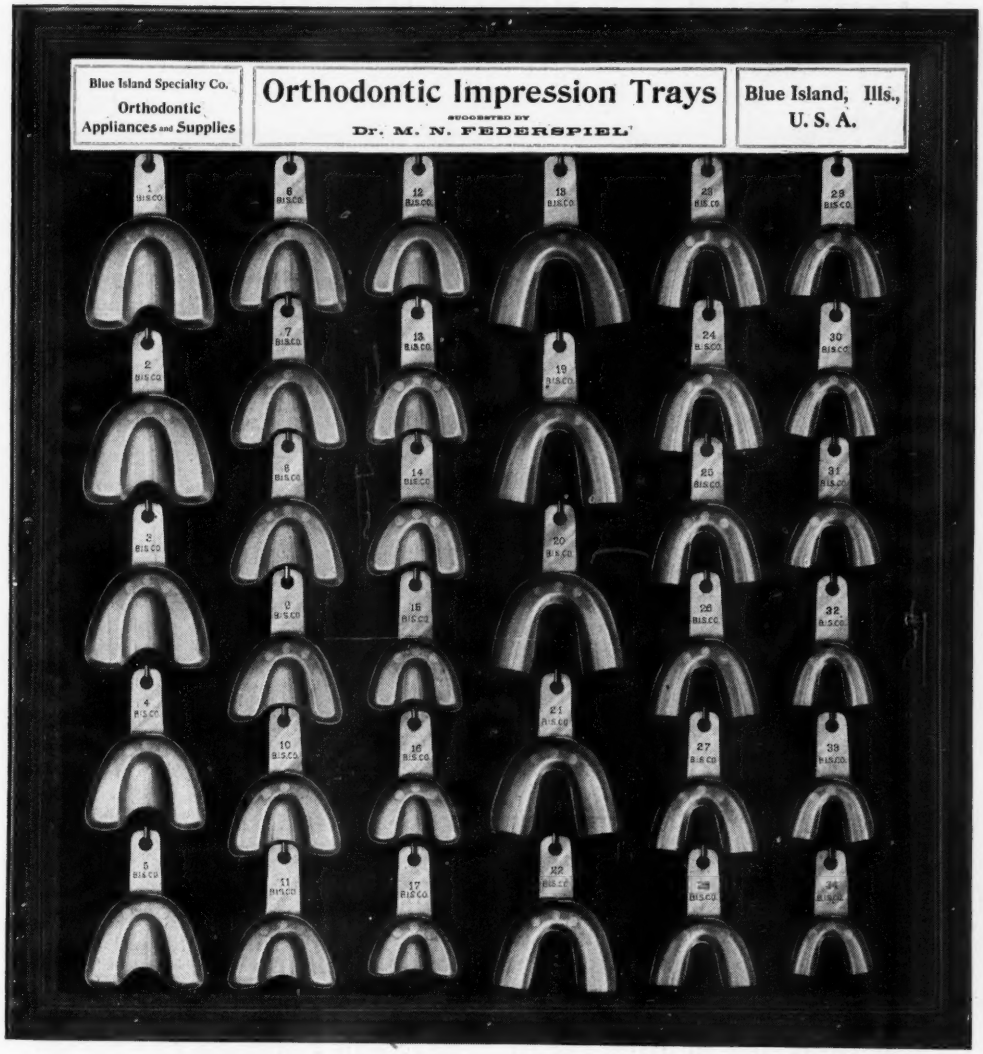
BLUE ISLAND SPECIALTY CO., Inc.

Orthodontic Appliances and Supplies
and Dental Specialties

BLUE ISLAND, ILL.
U. S. A.

Mention this Journal when writing to Advertisers.

IMPRESSION TRAYS



Impression Trays, Pressed Aluminum, Gauge 17, Handle Gauge 14

Trays number from 1 to 34. Complete set put up in handsome box: Mahogany, Oak, Ebony and White Enamel; also sold separate.
Special trays made to order. Impression tray catalogue sent on request.

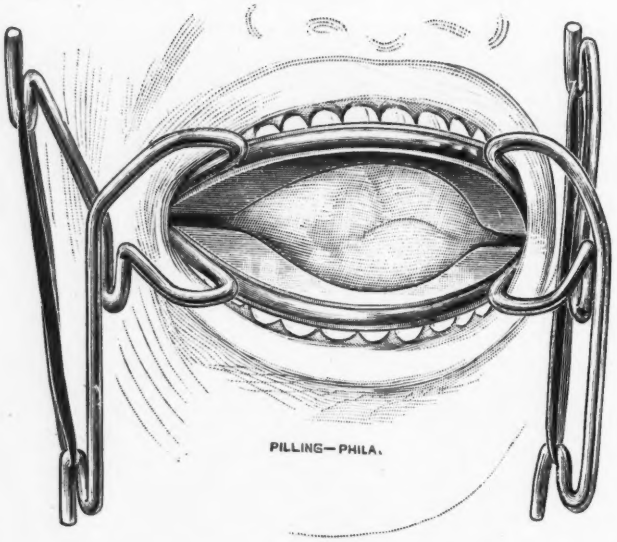
BLUE ISLAND SPECIALTY CO., Inc.

Orthodontic Appliances and Supplies
and Dental Specialties

BLUE ISLAND, ILL.
U. S. A.

PILLING MADE

JAW DILATOR AND EXERCISER



Suggested by DR. ROBERT H. IVY,

Professor of Clinical Maxillo-Facial Surgery, Dental Department,
University of Pennsylvania

For overcoming limited motion of the mandible from any cause such as muscular contracture or fibrosis following injury, infections in the lower molar region, etc. It is also of great value as an adjunct to operative treatment of ankylosis.

The apparatus is ready for immediate use in any case with not less than one centimeter of separation between the upper and lower teeth, without the necessity of impression taking. Can be applied readily without any special skill, and can be used much earlier in the case when there may be insufficient room for taking impressions.

SET CONSISTING OF UPPER AND LOWER

PRICE $5.00 NET

THE GEORGE P. PILLING & SON COMPANY,
PHILADELPHIA.

Mention this Journal when writing to Advertisers.

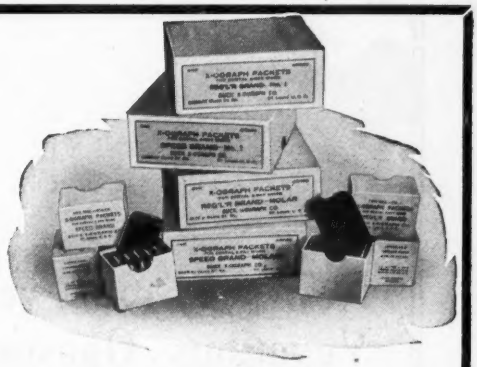
X-OGRAPH

"The mark of more certain diagnosis"

DENTAL FILM PACKETS

NO specialty in the entire history of the X-ray has met with such an instant and continuous demand as this thin, impressionable, metal-backed film packet.

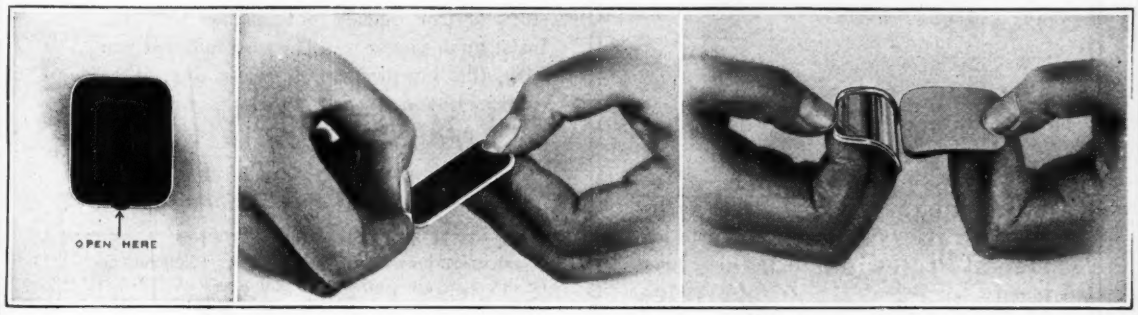
There is a wealth of brilliancy, contrast and latitude to the film, while the detail is greatly enhanced by the solid metal-backing, which eliminates to an extreme degree the secondary radiation, so noticeable in dental film packets less substantially constructed.



No. 1—Size 1¼ x 1⅝ inches
Molar Size 1 x 1¼ inches

Both sizes made in Regular (slow) and Speed (fast) brand.

NOTE below with what ease the packet is opened and how the emulsion side of the film is protected from finger marks by the water-proof front.

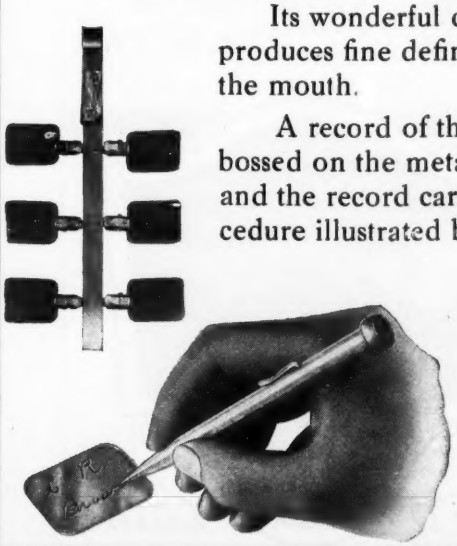


No Confusion in Separating the Two Films from the Single Sheet of Black Paper

IT is trim and tight, with no seams or folds to absorb saliva, and its bright, metallic appearance suggests to the patient a clean and sanitary surgical instrument.

Its wonderful ductility greatly aids in overcoming distortion and produces fine definition by conforming snugly to the curvatures of the mouth.

A record of the film and teeth, or patient rayed, may be embossed on the metal side of the packet with an ordinary lead pencil, and the record carried through the dark room by the simple procedure illustrated below.



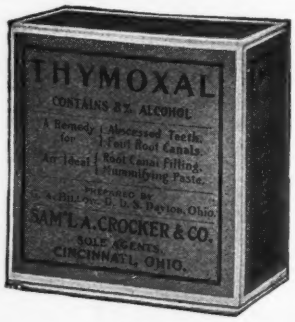
It is profitable for you to use those materials which give the best results and the least inconvenience.

BUCK X-OGRAPH CO.

SAINT LOUIS, MO.

New Way to Solve a Vexatious Question

A new root canal filling material and abscess remedy that will please you.



Thymoxal proves itself worthy of its claim in tryout by Dental Profession. Order a box today and try it yourself, price $1.50 complete. Thymoxal consists of a powder and a liquid which are mixed on a cement slab like cement, then worked into the root canals. There it hardens. After twenty-four hours it can be removed by taper broach or it can remain there as a permanent root canal filling.

Full directions with every package; ask your dealer to explain it to you.

For sale by Dental Dealers.
Order direct if your dealer does not stock it, giving dealer's name.

MANUFACTURED BY
The SAM'L A. CROCKER COMPANY
P. O. Box 838 Cincinnati, Ohio

DUMORE
DENTAL LATHE

YOU will find the Type "D" efficient, dependable and durable. It compares favorably with high-priced lathes on the market—and at a fraction of their cost.

You require low speeds for certain classes of work and high speeds for others. The added flexibility assured by five different speed ranges permits grinding, polishing and finishing inlays, crowns, etc., as readily as polishing plates and bridges.

Your dealer either carries the DUMORE in stock or can quickly obtain one for you. Insist upon seeing it. Then compare, if you wish, this low-priced lathe with any other types. If you do this, the lathe you buy will be a DUMORE.

Specifications and Equipment

Motor—⅛ H. P. Universal, operating on either direct or alternating current.

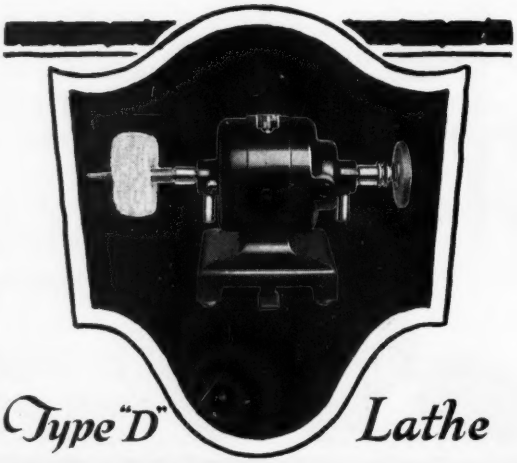
Finish—Black enamel.

Shaft—tapered on both ends to take Ritter chucks or 5/32" Goodell Pratt chucks.

Speeds—Five. Controlled by rheostat in motor base.

Complete equipment includes wheel arbor and emory wheel, tapered spindle and rag buff, 8' cord and attachment plug.

WISCONSIN ELECTRIC COMPANY
8753 Sixteenth St. Racine, Wis.



Type "D" Lathe

"A Scientific Instrument for the Correct Diagnosis of Dental X-Ray Films."

The Blum Binocular Dentascope is a scientific instrument which magnifies and gives stereoscopic effect to flat dental films.

You make two negatives at one exposure. You develop one to bring out the details of the soft structures—the other to bring out the detail of the dense structure.

Both are mounted in the special film-mount supplied, and placed in the scope.

A composite picture is formed of the two negatives—one picture—the detail of both negatives is shown as in one picture. The image stands out sharp and clear with wonderful stereoscopic effect.

Write Us To-day for Further Information.

The Engeln Electric Co.
4617 Euclid Ave. Cleveland, O.
Branches in all principal Cities

BLUM BINOCULAR DENTASCOPE

ALBADOR

AN 18 K. PALLADIUM WHITE GOLD Alloy made up for the purpose of providing a non-tarnishing material of all precious metals at a reasonable cost. It has a permanent white color and excellent working qualities.

EASILY FORMED INTO CROWNS. Porcelain will adhere to plates, because of freedom from oxidization.

A trial order of ALBADOR will tell more. If not satisfactory may be returned.

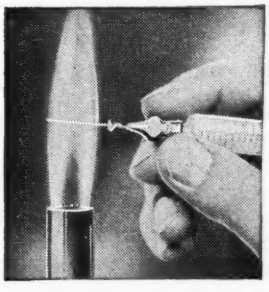
ALBADOR

Is one of our products of interest to the dental profession.

OTHERS ARE

Platinum Foil—Down to 1/2000"
Platinum-Iridium Wire
Platinum and Palladium Alloys with Gold
FOR VARIOUS DENTAL PURPOSES
Refining of Scraps, Filings, etc.

AMERICAN PLATINUM WORKS
N. J. R. R. Ave. at Oliver St.
NEWARK NEW JERSEY



SAFETY, STERILITY, SHARPNESS

30% IRIDIUM PLATINUM HYPO NEEDLES.

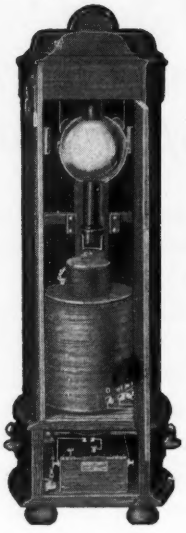
SAFE
The patented movable guard regulates the depth of injection and serves as a reinforcement.

STERILE
Needles can be heated to a degree to insure freedom from contamination. They cannot rust.

SHARP
The 30% Iridium Platinum retains *an edge like steel.*

For more detail, clip this ad and send in with your card.

FACTS



Other manufacturers are now trying to do what the Thwaites has done—

ELIMINATE DANGER

This we have been successful in doing for years by enclosing the dangerous high tension wires and tube in a beautiful cabinet. The mere fact that others are now trying to do this is proof that our unit is the most practical for the busy dentist.

SIMPLIFIED TECHNIQUE—SURE RESULTS

In the Thwaites, the tube is always stationary, giving the operator one positive point from which to work in getting angles. This simplified technique makes results more certain and enables the operator to get good pictures.

TIME SAVER

This technique and the general construction of our unit enables the operator to get better pictures in much less time than with the older style of open wire units. There are no parts in the Thwaites to get out of order, which is an added saving of time, and also expense.

In other words, the Thwaites Safety X-Ray is a high grade unit which is Safe, Simple and Sure; saving space, time and life. Our method of construction enables us to sell this high grade unit at a price within reach of every dentist. $565.00.

Write for further information and your copy of our catalog.

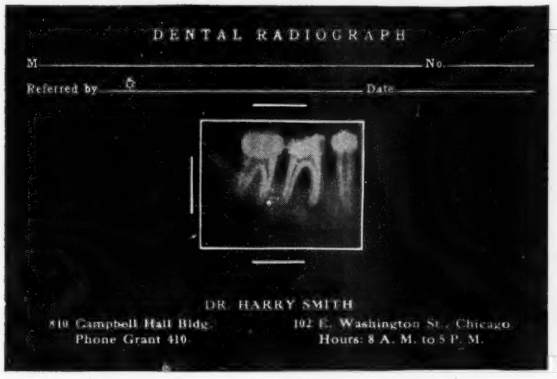
THWAITES X-RAY COMPANY

GRAND RAPIDS, MICH.

DENTAL X-RAY SUPPLIES

ONLY 2 OF OUR COMPLETE LINE

Everything needed for finest dental X-Ray work. Prompt shipment. Low prices—and Technical advice when desired



DENTAL FILM MOUNTS

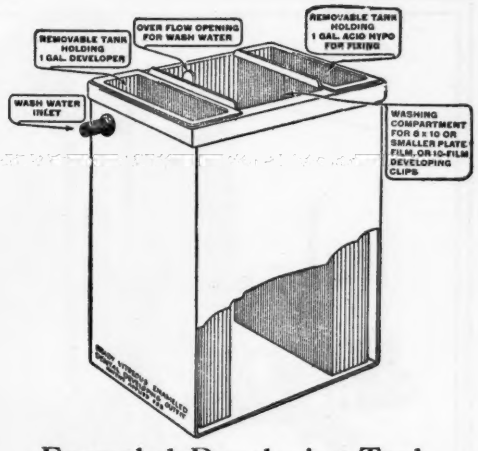
Black, Green or Gray Cardboard with celluloid windows. Also All-Celluloid

	Price per 100	200	300	500	1000
For 1 film	$ 3.35	$ 6.30	$ 8.70	$12.50	$25.00
" 2 "	4.50	7.50	10.50	16.25	32.50
" 3 "	5.50	9.50	13.50	20.00	40.00
" 4 "	6.70	11.10	15.90	27.50	54.50
" 5 "	9.00	16.00	23.00	35.00	70.10
"10 "	15.00	28.00	40.00	53.60	107.00

10% cash discount allowed from above prices.
$0.90 extra for imprinting, name and address.

GEO. W. BRADY & CO.

780 SO. WESTERN AVE. CHICAGO


REMOVABLE TANK HOLDING 1 GAL. DEVELOPER
OVER FLOW OPENING FOR WASH WATER
REMOVABLE TANK HOLDING 1 GAL. ACID HYPO FOR FIXING
WASH WATER INLET
WASHING COMPARTMENT FOR 8 x 10 OR SMALLER PLATE FILM, OR 10-FILM DEVELOPING CLIPS

Enameled Developing Tank

Set consists of 2 inner tanks for developer and fixer solutions. Holds 8x10 or smaller plates or Dental Films

Price $22.50 11x14 size $27.00

Two-Compartment Glass Tank	$1.50
Single Developing Clips, per doz.	1.25
Ten Film Dental Clip, each	1.25
Developer 20oz. size 0.30 ½ Gal.	0.90
Acid Hypo Fixing Bath, ½ Gal. size	0.30
8x10 Film Developing Hangers	1.25
Dental pointer cone, for getting the correct distance, angle, and position	6.00
Buck X-Ograph Dental Films, per dozen	.75
Eastman Dental Films, per dozen	.70

WE CARRY ALL SIZES OF

Dental X-Ray Films and X-Ray Plates in stock for quick shipment, also a wide line of other X-Ray supplies.

Send for complete price list with discount sheet.

For this purpose Alloy "J" Wire has no superior -:-

In orthodontia cases, where wire appliances are employed—appliances made with care and exactitude and the expenditure of much time, it is more than ordinarily essential that the material should be as nearly ideal as possible.

We repeat; for this purpose Alloy "J" Wire has no superior.

Resolved upon the production of a material, the best possible for the purpose; we did not rest content until we had evolved an alloy that exhibited the maximum of those qualities that an orthodontic wire must have.

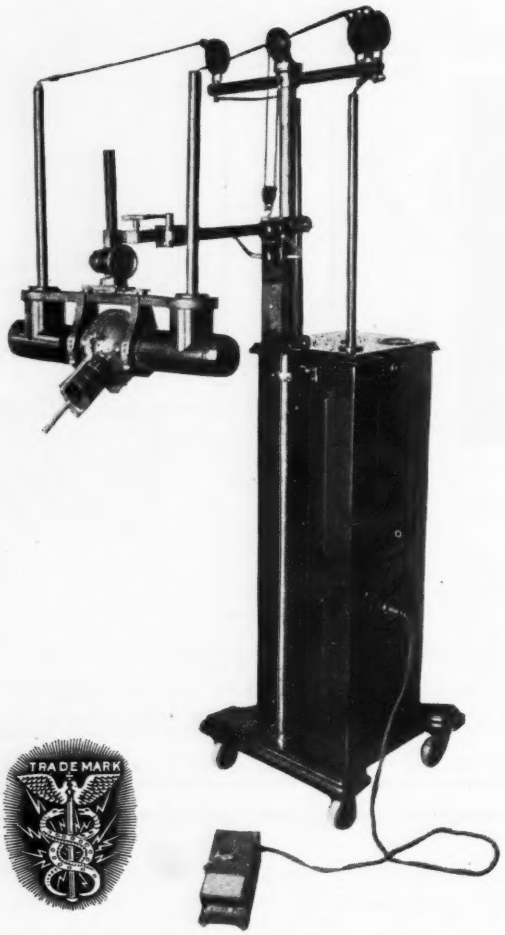
Alloy "J" wire is unusually rich in Palladium, Platinum and Gold and it displays an amount of resilience, after the processes of soldering and being cast against, that no other can claim. Moreover, Alloy "J" Wire is always absolutely uniform and its permanent springiness, taken together with this, just about make Alloy "J" Wire one thing that you cannot afford to pass by without investigation.

A line to us will bring you further details. Just make a memorandum to send it, doctor, you may forget it otherwise.

BAKER & CO., INC.

Refiners and Workers of Platinum Gold and Silver

30 Church St. New York — 54 Austin St. NEWARK, N. J. — 5 S. Wabash Ave. Chicago.



New Model Waugh Interrupterless X-Ray Unit

Improvements consist of changes in transformer and covering of both ends of the Coolidge Tube, so that neither the operator nor the patient can be shocked.

It also has our automatic current regulator. This keeps the number of milliamperes constant, irrespective of tube changes or line changes. No auto-transformer can accomplish this result.

On account of the special short Coolidge Tube, practically all adjustments are made by simply rotating the tube.

This apparatus enables the operator to use the standardized methods suggested by Dr. F. T. VanWoert, of New York City, so that identical positions can be accurately reproduced.

Floor space occupied by this machine 19x20″

Prices complete including Coolidge Tube—

Alternating Current	**$700.00**
Direct Current	**800.00**
Automatic Time Foot Switch	**30.00**

Waite & Bartlett Manufacturing Co.

Main Office & Factory, 53 Jackson Ave., L. I. City

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Seattle, Wash., (B. W. Small)	**1307 E. 45th St.**
Melbourne, Australia, (Stanforth X-Ray & Radium Co.)	**214 Russell St.**

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No—

Pepsodent does not scratch

The polishing agent is softer than the enamel.

We have brushed natural teeth with Pepsodent 250,000 times without the slightest ill effect. One authority we know has brushed soft gold with it 150,000 times.

Pepsodent omits soap, because modern authorities desire a tooth paste to be mildly acid. That absence of soap—a lubricant—is what makes the polishing agent conspicuous.

Pepsodent, being mildly acid, stimulates the salivary flow. It increases the ptyalin in saliva, to better digest starch deposits. It increases the alkalinity of saliva, to better combat mouth acids.

It combats mucin plaque in two effective ways.

By meeting these requirements in ideal ways, it has won dentists and dental authorities nearly all the world over. Millions of people of some forty nations now use it, largely by dental advice.

Ask us for information on any point in doubt. Send the coupon for a tube to test.

Pepsodent
PAT. OFF.
REG. U.S.

A Modern Dentifrice

An acid tooth paste which brings five effects desired by modern authorities

THE PEPSODENT COMPANY, 933
2111 Ludington Bldg., Chicago, Ill.

Please send me, free of charge, one regular 50c size tube of Pepsodent, with literature and formula.

Name .....

Address .....

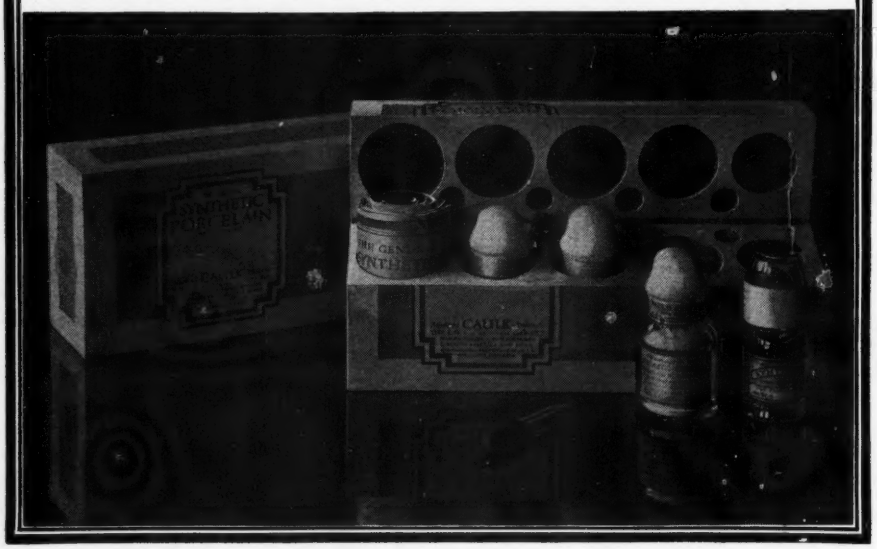
Enclose card or letterhead

The next time you need SYNTHETIC PORCELAIN order the new economy package and save a dollar

shades 3-6-15 all in one box

$11. worth for $10.

DE TREY'S SYNTHETIC PORCELAIN, MADE BY THE L. D. CAULK CO., MILFORD, DEL.



You should know
Your Patients will ask
—DON'T WAIT

Formula of W. M. Ruthrauff, A.B., A.M.,
Inventor of the first Acid Tooth Paste

ACIDENT is the result of nine years of scientific research by W. M. RUTHRAUFF, the pioneer in the acid tooth paste field. ACIDENT not only excels in its cleansing and polishing action but accomplishes a result never before believed possible.

THE CALCIFICATION OF THE TEETH
AS A MEANS OF COUNTERACTING
TOOTH DECAY

ACIDENT is both chemically and mechanically harmless to the teeth, the delicate mucous membrane lining of the mouth, and the gold work.

Literature and samples of ACIDENT will be sent to any dentist or physician upon request.

Please mail card or letterhead with coupon below

W. M. RUTHRAUFF COMPANY
Twenty Second & Arch Streets.
PHILADELPHIA. U S.A.

W. M. Ruthrauff Co., Dept. 57
Philadelphia, Pa.

Kindly send me literature and three 50c. tubes of ACIDENT Tooth Paste, free of charge. Professional card is attached.

Name ..... Dentist, Physician

Address .....

City & State .....

WE MANUFACTURE

a full line of Orthodontic appliances of all kinds. The quality is of the very best—the prices are always just and moderate.

The J. Bird Moyer Co., Inc. **1212 Vine St., Philadelphia, U. S. A.**

La Province Dentaire

An Independent Journal of Dental Science exclusively devoted to the Advancement of the Profession, and published six times yearly in Lyon, France

"La Province Dentaire" publishes scientific papers from specialists in every branch of dentistry.

"La Province Dentaire" is the most profusely illustrated independent journal in France.

"La Province Dentaire" publishes legal advice and chronicles by an eminent lawyer, and articles on insurance questions by a specialist.

"La Province Dentaire" is the official organ of the French Society for Dento-Facial Orthopedia.

"La Province Dentaire" receives, reads and, when necessary, reviews, nearly sixty dental, medical and surgical journals from all parts of the world.

"La Province Dentaire" reports important French and International Society Meetings.

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Dr. James T. Quintero

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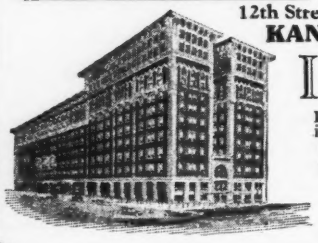
HOTELS

Baltimore Muehlebach

12th Street and Baltimore Avenue

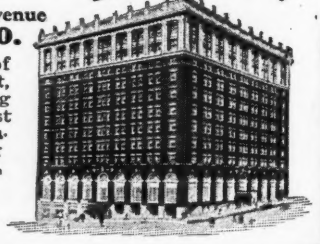
KANSAS CITY, MO.



IN the very center of the business district, the combined buying power giving the best in room accommodations, cafe and dining service at fair prices.

S. J. WHITMORE, Chairman

JOSEPH REICHL, V-P and Gen. Mgr.



500 ROOMS Jos. R. DUMONT, Mgr Hotel Baltimore **500 ROOMS**

Mention this Journal when writing to Advertisers.

Announcing

EASTMAN

NON-CURLING

Dental X-Ray Films

The latest improvement in Eastman Dental X-Ray Films marks a distinct advance in dental film technique. In dental films previously manufactured there was a tendency for the finished negative to curl on drying, due to contraction of the emulsion coating. In the new non-curling film the base or support is specially treated to overcome this tendency and the negatives lie flat when finished and remain flat even when thoroughly dried out.

Eastman Non-Curling Films are made in both the clear and translucent types and in two speeds, Regular and Extra Fast, as before. There are no changes in the emulsion characteristics. All types in the new package.

Price remains the same: $1.45 per package of two dozen.

Eastman Kodak Company

Medical Division Rochester, N. Y.

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THE JOURNAL OF ORALOGY

DISEASE PREVENTION THROUGH MEDICAL AND DENTAL CO-OPERATION

Published quarterly by the

AMERICAN ACADEMY OF APPLIED DENTAL SCIENCE

ALFRED ASGIS, DDS, *Editor*, *640 Madison Avenue, New York.*
WALTER VEAZIE, Ph.D., *Bus. Mgr.*, *640 Madison Avenue, New York.*
IRVING STIER, DDS, *Cir. Mgr.*, *587 Fifth Avenue, New York.*

It aims to present to the dental and medical practitioner, as well as the layman, articles by recognized authorities on new and vital viewpoints in the healing professions.

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Medical Co-operation ..... M. J. Synnott, AM, MD
Co-operation in Practice ..... G. D. Laymon, DDS
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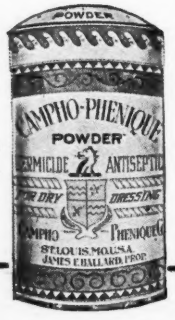

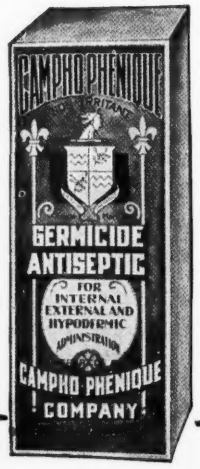

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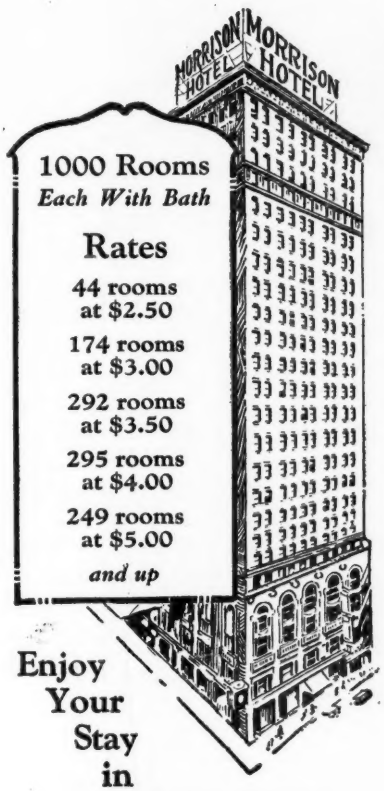

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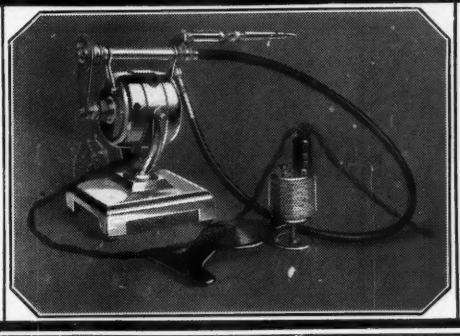

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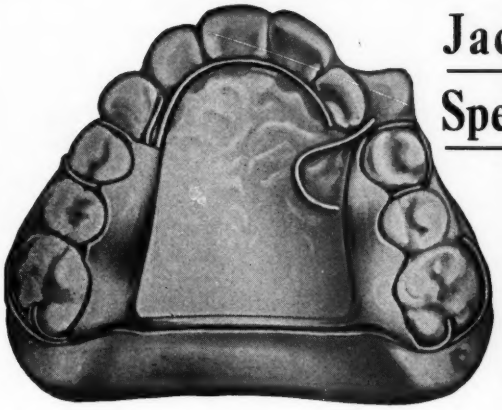

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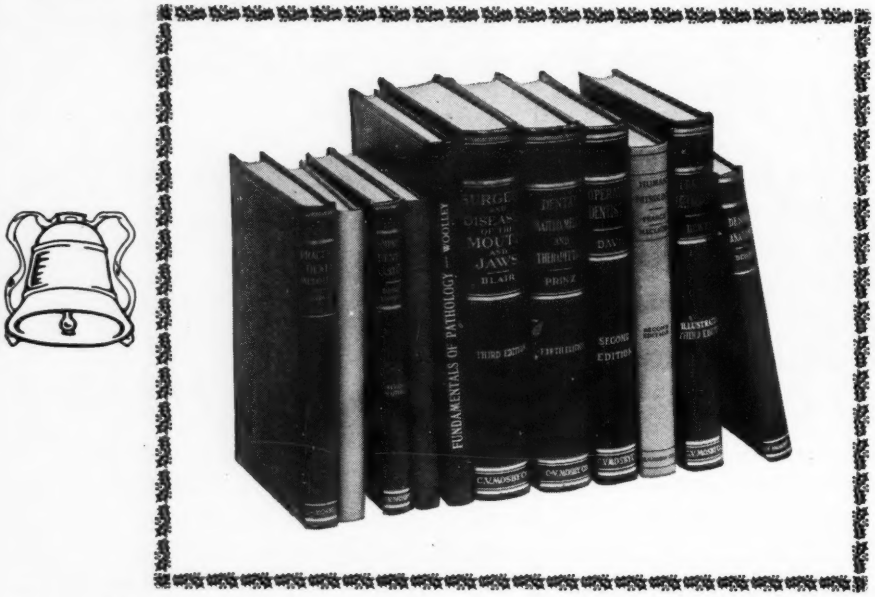

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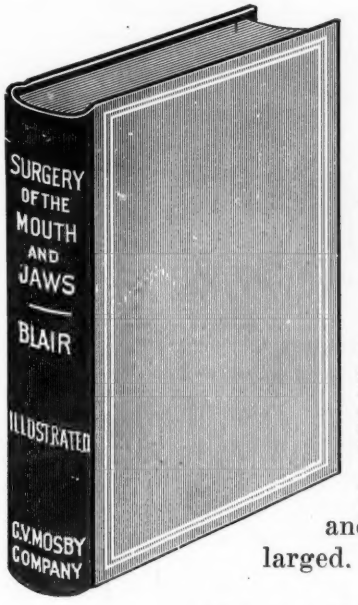

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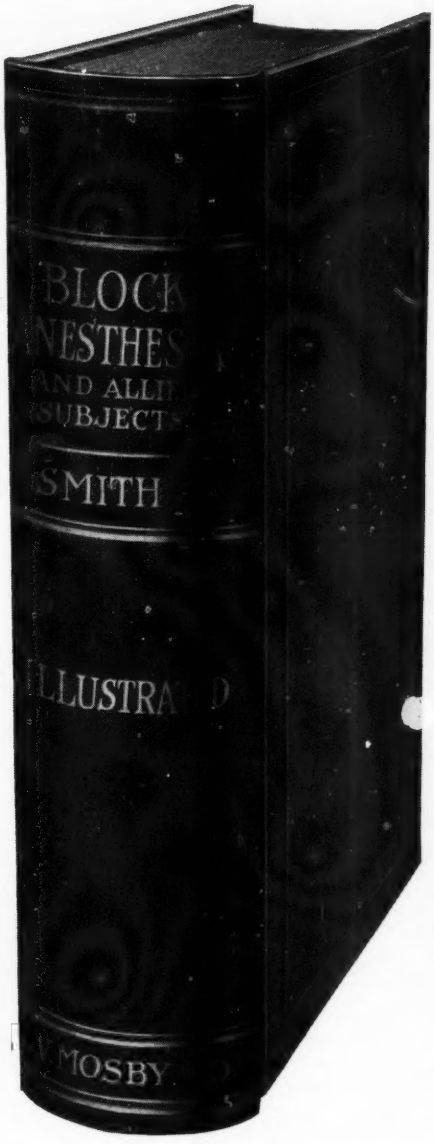

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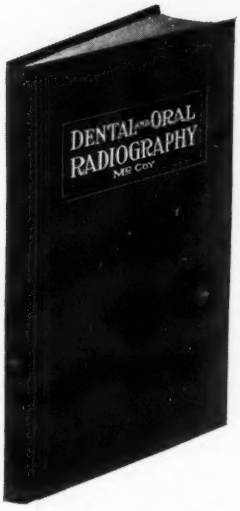

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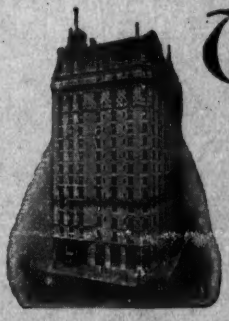

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